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# CHEMISTRY

## 1941-1951

STAFF

DEVELOPMENTS

COURSES AND CURRICULA

PUBLICATIONS

DOCTORATE DEGREES

**SAMUEL WILSON PARR 1857-1931**

University of Illinois, A.B., 1884; Cornell University, A.M., 1885; Lehigh University, Sc.D. (hon.), 1925; Illinois College, Sc.D. (hon.), 1929. Chandler Medal, 1926. President of the American Chemical Society, 1928.

The influence of Samuel Wilson Parr always will be remembered as a major contribution to the growth and development of chemistry and chemical engineering at the University of Illinois. He nurtured and developed the program until the training in chemical engineering became recognized nationally.

Following several years of teaching, Professor Parr was appointed Professor in the Chemistry Department, in 1891, where he served until his retirement in 1926. Professor Parr taught the first courses in applied chemistry at the University of Illinois, and, in 1894, he was designated Professor of Applied Chemistry in recognition of the need for a distinct division to comply with "the growing demand for chemical knowledge in the industrial world." In 1901, Professor Parr established the curriculum of chemical engineering essentially as it exists today.

Professor Parr's contributions to research were those of a distinguished and productive scholar. His chief interest was the chemistry of coal and coal products; he studied their properties and uses from every angle. He supplied industry with practical instruments for use primarily in coal analyses, the Parr Peroxide Calorimeter, the gas calorimeter, the automatic recording gas calorimeter, and the sulfur photometer. His discovery that bituminous coal, after drying below coking temperatures, decomposes with an exothermic reaction when heated to a higher temperature resulted in a uniform and rapid coking process superior to any hitherto known.

His extensive investigation of alloys was rewarded by the discovery of the nonferrous alloy "Illium," of high tensile strength and ductibility, excellent working qualities, and a resistance to corrosion almost equal to that of the noble metals.

Professor Parr had many other research interests. Especially noteworthy was his solution of the problem of the embrittlement of boiler steel which resulted in vast savings in industries throughout the country.

An inspiring teacher, a sympathetic adviser of students and younger staff members, Professor Parr was beloved by all who knew him. It is because of his contributions to the development and success of chemistry and chemical engineering at Illinois that he was honored at the dedication of the new East

Chemistry Building by the installation of a plaque in the main entrance of the building, the inscription on which reads: "This Laboratory of Chemistry and Chemical Engineering is dedicated to the memory of Samuel Wilson Parr, 1857-1931, distinguished member of the Chemistry Department of the University of Illinois, 1891-1926."

JAN 1 '53 MARSHALL

## EAST CHEMISTRY BUILDING DEDICATION

Dedication ceremonies for the East Chemistry Building were held on Friday and Saturday, March 30 and 31, 1951. Professor Roger Adams gave the main address in which he spoke of the growth of the department and the contributions of Professor Samuel Wilson Parr, to whom the building is dedicated.

At a banquet, held on Friday evening, Sidney D. Kirkpatrick, a graduate in chemical engineering and now Vice President and Director of Editorial Development, McGraw-Hill Book Company, Inc., New York, was the toastmaster. On that occasion, two previous heads of the divisions of chemical engineering and biochemistry, Dr. Donald B. Keyes, Consultant to the Heyden Chemical Corporation, and Professor Howard B. Lewis, John Jacob Abel Professor of Biological Chemistry at the University of Michigan, discussed developments in their fields during the past half-century. Each division held a scientific program on Saturday morning under the direction of the present heads, Professor H. F. Johnstone and Professor W. C. Rose. The speakers were alumni of the department.

### Chemical Engineering Program

**The Mixing of Gases and Solids in Beds of Fluidized Solids** — Edwin R. Gilliland (B.S., 1930; Sc.D., Massachusetts Institute of Technology, 1933). Professor of Chemical Engineering, Massachusetts Institute of Technology.

**Mathematical Techniques in Chemical Engineering Research** — Robert L. Pigford (Ph.D., 1942). Chairman, Department of Chemical Engineering, University of Delaware.

**Accomplishments and Prospects of High Pressure Technology** — Norman W. Krase (B.S., 1918; Ph.D., Yale University, 1926). Development Department, E. I. duPont de Nemours and Company.

**Process Development in the Food and Agricultural Industries** — William Lawrence Faith (Ph.D., 1932). Director of Engineering, Chemical Division, Corn Products Refining Company.

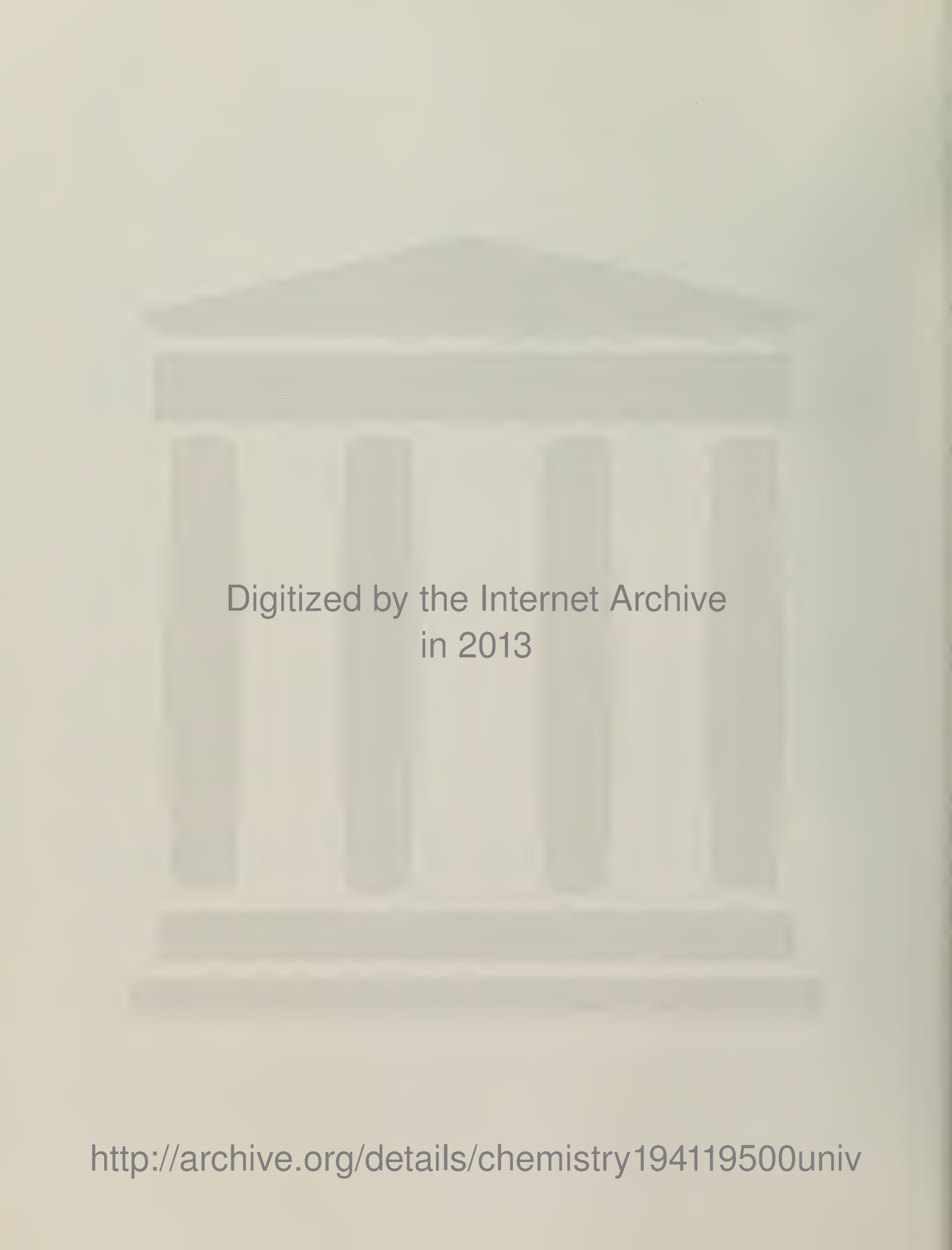
### Biochemistry Program

**Some Aspects of Steroid Metabolism** — Edward A. Doisy (M.S., 1916; Ph.D., Harvard University, 1920). Director, Department of Biochemistry, School of Medicine, St. Louis University.

**The Effect of Individual Amino Acids on the Requirement of Choline** — Wendell H. Griffith (Ph.D., 1923). Chairman, Department of Biological Chemistry and Nutrition, School of Medicine, University of Texas.

**Transmethylation and the Biological Synthesis of the Labile Methyl Group** — Vincent du Vigneaud (M.S., 1924; Ph.D., University of Rochester, 1927). Head, Department of Biochemistry, College of Medicine, Cornell University.

**The Role of Biochemistry in Industry** — Thomas R. Wood (Ph.D., 1940). Head, Veterinary Biological Section, Grasselli Chemicals Department, E. I. duPont de Nemours and Company.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- Publications, 1870-1940

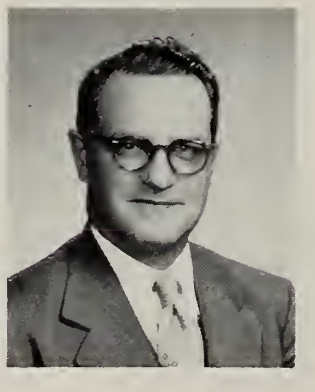
# STAFF OF THE DEPARTMENT OF CHEMISTRY, 1950-1951

**ROGER ADAMS**
Professor of Organic Chemistry and Head of the Department of Chemistry. A.B., 1909, A.M., 1910, Ph.D., 1912, Harvard University; Sc.D., 1935, Polytechnic Institute, Brooklyn; Sc.D., 1942, Northwestern University; Sc.D., 1943, University of Rochester; Sc.D., 1945, Harvard University; ScD., 1947, University of Pennsylvania; Sc.D., 1948, Yale University.

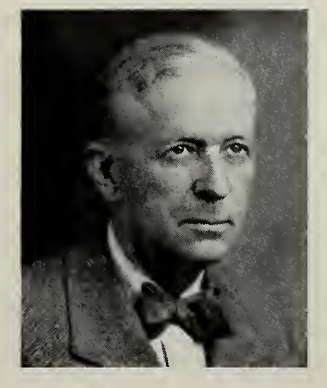
**WILLIAM CUMMING ROSE**
Professor of Biochemistry. B.S., 1907, Davidson College; Ph.D., 1911, Yale University; Sc.D., 1947, Davidson College; Sc.D., 1947, Yale University.

**B SMITH HOPKINS**
Professor of Inorganic Chemistry (Emeritus). A.B., 1896, A.M., 1897, Albion College; Ph.D., 1906, Johns Hopkins University; Sc.D., 1926, Albion College; LL.D., 1940, Carroll College.

**CARL SHIPP MARVEL**
Professor of Organic Chemistry. A.B., 1915, Illinois Wesleyan University; A.M., 1916, Ph.D., 1920, University of Illinois; Sc.D., 1946, Illinois Wesleyan University.



**HENRY FRASER JOHNSTONE**
Professor of Chemical Engineering. B.S., 1923, University of the South; M.S., 1925, Ph.D., 1926, State University of Iowa.



**WORTH HUFF RODEBUSH**
Professor of Physical Chemistry. A.B., 1912, A.M., 1914, University of Kansas; Ph.D., 1917, University of California.

**ARTHUR MOSES BUSWELL**
Research Professor of Chemistry and Chief of the State Water Survey. A.B., 1910, University of Minnesota; A.M., 1912, University of Maine; Ph.D., 1917, Columbia University.

**REYNOLD CLAYTON FUSON**
Professor of Organic Chemistry. A.B., 1920, Montana State University; A.M., 1921, University of California; Ph.D., 1924, University of Minnesota; D.Sc., 1946, Montana State University.

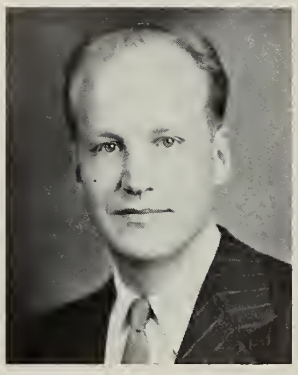
**GEORGE LINDENBERG CLARK**
Professor of Analytical Chemistry. B.S., 1914, De Pauw University; M.S., 1914, Ph.D., 1918, University of Chicago; Sc.D., 1937, De Pauw University.

**JOHN CHRISTIAN BAILAR, JR.**
Professor of Inorganic Chemistry. A.B., 1924, A.M., 1925, University of Colorado; Ph.D., 1928, University of Michigan.

**HERBERT EDMUND CARTER**
Professor of Biochemistry. A.B., 1930, De Pauw University; A.M., 1931, Ph.D., 1934, University of Illinois.

**FREDERICK THEODORE WALL**
Professor of Physical Chemistry and Acting Dean of the Graduate College (1951-52). B.Chem., 1933, Ph.D., 1937, University of Minnesota.

**LUDWIG FREDERICK AUDRIETH**
Professor of Inorganic Chemistry. B.S., 1922, Colgate University; Ph.D., 1926, Cornell University.



**HERBERT AUGUST LAITINEN**
Professor of Analytical Chemistry. B.Chem., 1936, Ph.D., 1940, University of Minnesota.

**EDWARD WALTER COMINGS**
Professor of Chemical Engineering. B.S., 1930, University of Illinois; Sc.D., 1934, Massachusetts Institute of Technology.

**THOMAS ERWIN PHIPPS**
Professor of Physical Chemistry. A.B., 1915, A.M., 1916, University of Texas; Ph.D., 1921, University of California.

**HAROLD RAY SNYDER**
Professor of Organic Chemistry. B.S., 1931, University of Illinois; Ph.D., 1935, Cornell University.

**DUANE TAYLOR ENGLIS**
Professor of Analytical Chemistry. A.B., 1912, Eureka College; A.M., 1914, Ph.D., 1916, University of Illinois.

**GEORGE FREDERICK SMITH**
Professor of Analytical Chemistry. B.S., 1917, M.S., 1919, Ph.D., 1922, University of Michigan.

**SHERLOCK SWANN, JR.**
Research Professor of Chemical Engineering. B.S., 1922, Princeton University; Ph.D., 1926, Johns Hopkins University.

**FREDERICK GUY STRAUB**
Special Research Professor of Chemical Engineering. B.S., 1920, University of Illinois; M.S., 1923, Met.E., 1928, Pennsylvania State College.

**ROBERT BROKAW DUFFIELD**
Associate Professor of Physics and Physical Chemistry. B.A., 1940, Princeton University; Ph.D., 1943, University of California.

**NELSON JORDON LEONARD**
Associate Professor of Organic Chemistry. B.S., 1937, Lehigh University; B.Sc., 1940, Oxford University; Ph.D., 1942, Columbia University.

**GEORGE THERALD MOELLER**
Associate Professor of Inorganic Chemistry. B.S., 1934, Oregon State College; Ph.D., 1938, University of Wisconsin.

**HARRY GEORGE DRICKAMER**
Associate Professor of Chemical Engineering. B.S., 1941, M.S., 1946, Ph.D., 1946, University of Michigan.

**CARL SWENSSON VESTLING**
Associate Professor of Biochemistry. A.B., 1934, Carleton College; Ph.D., 1938, Johns Hopkins University.

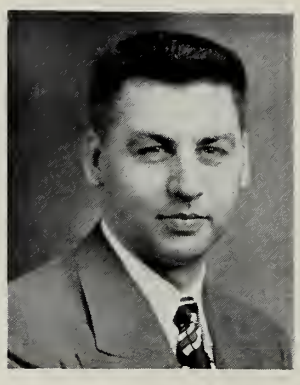
**B. ROGER RAY**
Assistant Professor of Physical Chemistry. B.S., 1935, College of Idaho; M.S., 1940, Oregon State College; Ph.D., 1945, University of Michigan.

**LA VELL MERL HENDERSON**
Assistant Professor of Biochemistry. B.S., 1939, Utah State Agricultural College; M.S., 1941, Ph.D., 1947, University of Wisconsin.

**VIRGINIA BARTOW**
Assistant Professor of Inorganic Chemistry. A.B., 1918, Vassar College; A.M., 1921, Ph.D., 1923, University of Illinois.

***ELLIOT RITCHIE ALEXANDER**
Assistant Professor of Organic Chemistry. A.B., 1941, Swarthmore College; A.M., 1942, Ph.D., 1944, Columbia University.

*Deceased, October 23, 1950.



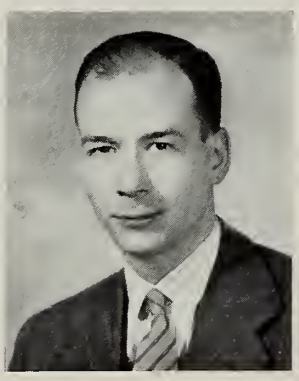
**PETER EWALD YANKWICH**
Assistant Professor of Physical Chemistry. B.S., 1943, Ph.D., 1945, University of California.

**THOMAS BARON**
Assistant Professor of Chemical Engineering. B.S., 1943, Ph.D., 1948, University of Illinois.

**LEONARD EDWARD MILLER**
Assistant Professor of Organic Chemistry. B.S., 1940, M.S., 1942, Ph.D., 1943, University of Michigan.

**DONALD RAY MARTIN**
Assistant Professor of Inorganic Chemistry. A.B., 1937, Otterbein College; M.S., 1940, Ph.D., 1941, Western Reserve University.

**JAMES WILLIAM WESTWATER**
Assistant Professor of Chemical Engineering. B.S., 1941, University of Illinois; M.Ch.E., 1943, Ph.D., 1948, University of Delaware.



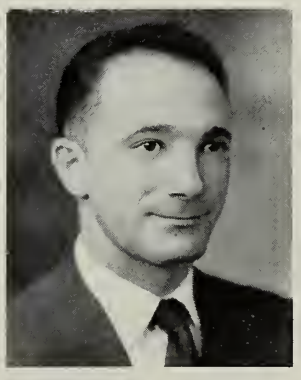
**ROBERT KARL FINN**
Assistant Professor of Chemical Engineering. B.Chem., 1941, Ch.E., 1942, Cornell University; Ph.D., 1946, University of Minnesota.

**ROBERT FORREST NYSTROM**
Assistant Professor of Chemistry. S.B., 1942, Ph.D., 1947, University of Chicago.

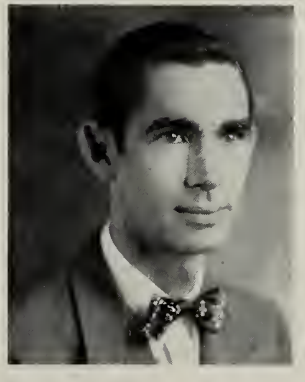
**ROSALIE MARY PARR**
Associate in Inorganic Chemistry (Emerita). B.A., 1906, A.M., 1911, Ph.D., 1916, University of Illinois.

**HERBERT SANDER GUTOWSKY**
Instructor in Physical Chemistry. A.B., 1940, Indiana University; M.S., 1946, University of California; Ph.D., 1949, Harvard University.

**RALPH ALTON JOHNSON**
Instructor in Analytical Chemistry. B.A., 1940, Hastings College; M.S., 1942, University of Colorado; Ph.D., 1949, University of Minnesota.



**MILTON TAMRES**
Instructor in Inorganic Chemistry. B.A., 1943, Brooklyn College; Ph.D., 1949, Northwestern University.



**GORDON LAKE BUSHEY**
Instructor in Inorganic Chemistry. B.S., 1943, M.A., 1944, Ph.D., 1948, Rice Institute.

**CARL EMIL JOHNSON, JR.**
Instructor in Inorganic Chemistry. B.S., 1943, University of California at Berkeley; Ph.D., 1950, University of California at Los Angeles.

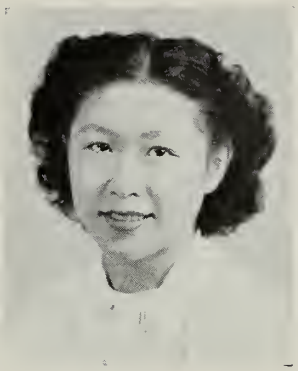
**HAROLD KIRKWOOD INSKIP**
Instructor in Organic Chemistry. B.S., 1944, M.S., 1948, Ph.D., 1950, Yale University.

**SHIRLEY WILLIAM PELLETIER**
Instructor in Organic Chemistry. B.S., 1947, University of Illinois; Ph.D., 1950, Cornell University.

**EMILY ELIZABETH DAVIS**
Microanalyst. B.S., 1948, Ohio State University.

**JEAN FORTNEY (MRS.)**
Microanalyst. B.S., 1950, University of Illinois.

**ELIZABETH MARIE PETERSEN**
Infrared Spectroscopist. B.S., 1949, Simmons College.
*(No picture available.)*



**KATHERINE PIH (MRS.)**
Microanalyst. B.S., 1945, Hwa Nan College.

## Assistants in Chemistry

**James Dehaven Batchelor**
Assistant in Chemical Engineering
B.Ch.E., 1948, University of Virginia
M.S.Ch.E., 1950, University of Illinois

**John Joseph Beer,** Assistant in Chemistry
B.A., 1950, Earlham College

**Harry Ray Beilfuss,** Assistant in Chemistry
B.A., 1949, Carleton College

**James Wesley Berry,** Assistant in Chemistry
A.B., 1949, Augustana College

**Eugene P. Bertin, Jr.,** Assistant in Chemistry
B.S., 1948, M.S., 1949, University of Illinois

**Roy Henderson Bible,** Assistant in Chemistry
B.S., 1948, Virginia Polytechnic Institute
M.S., 1949, University of Illinois

**Paul Emmanuel Bierstedt,** Assistant in Chemistry
B.S., 1950, Ohio State University

**Homer James Birch,** Assistant in Chemistry
B.S., 1941, Youngstown College
M.S., 1949, University of Illinois

**Stephen John Bodnar,** Assistant in Chemistry
A.B., 1950, Lafayette College

**David Bruce Bright,** Assistant in Chemistry
B.Chem., 1949, University of Minnesota
M.S., 1950, University of Illinois

**Victor Ernest Buhrke,** Assistant in Chemistry
B.S., 1950, University of Illinois

**John Preston Bullard, Jr.,** Assistant in Chemistry
B.S., 1949, University of Illinois

**Bruce Burton Burnett,** Assistant in Chemistry
B.S., 1950, Lehigh University

**David Wilcox Carley,** Assistant in Chemistry
B.A., 1943, M.S., 1947, Knox College

**Louis A. Carpino,** Assistant in Chemistry
B.S., 1950, Iowa State College

**John Victor Clarke, Jr.,** Assistant in Chemistry
B.S., 1949, Polytechnic Institute of Brooklyn

**Richard Cole,** Assistant in Chemistry
B.Ch.E., 1944, College of the City of New York
M.S., 1948, University of Illinois

**Paul LaVerne Cook,** Assistant in Chemistry
A.B., 1950, Hope College

**Wilmer Ray Cornman, Jr.,** Assistant in Chemistry
B.S., 1950, Lafayette College

**Richard Burton Cuddeback**
Assistant in Chemical Engineering
B.S., 1949, University of Rochester

**Donn Duane Darsow,** Assistant in Chemistry
B.A., 1950, University of Minnesota

**Eugene Earl Dekker,** Assistant in Chemistry
A.B., 1949, Calvin College

**Laurence Francis Dempsey,** Assistant in Chemistry
B.S., 1946, Pennsylvania State College

**Tuiskon Dick,** Assistant in Chemistry
B.S., 1946, University do Rio Grande do Sul

**Elmer Lloyd Dougherty**
Assistant in Chemical Engineering
B.S., 1950, University of Kansas

**John Robert Dyer,** Assistant in Chemistry
B.S., 1950, Northwestern University

**Michael Johann Eitel,** Assistant in Chemistry
B.S., 1950, University of Tennessee

**Frank Vernon Fair,** Assistant in Chemistry
B.S., 1949, Pennsylvania State College

**Harold Marvin Foster,** Assistant in Chemistry
B.S.Ch.E., 1950, Lehigh University

**Richard Cuneo Fox,** Assistant in Chemistry
B.S., 1950, Massachusetts Institute of Technology

**Jeremiah P. Freeman,** Assistant in Chemistry
B.S., 1950, University of Notre Dame

**Jerome Freiling**
Assistant in Chemical Engineering
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**John Owen Gardner,** Assistant in Chemistry
B.S., 1950, University of Illinois

**Ralph Gher, Jr.,** Assistant in Chemistry
B.A., 1948, M.S., 1949, University of Illinois

**Jack Mealey Gillette,** Assistant in Chemistry
B.S., 1947, Bradley University
M.S., 1949, University of Illinois

**Allan Dale Gott,** Assistant in Chemistry
B.S., 1948, University of the South
M.S., 1949, University of Illinois

**Merland William Grieb,** Assistant in Chemistry
B.S., 1942, M.S., 1949, University of Idaho

**Emil William Grieshaber,** Assistant in Chemistry
B.S., 1947, University of Wisconsin
M.S., 1949, University of Illinois

**Byron Lee Haines,** Assistant in Chemistry
B.A., 1950, Hanover College

**Richard F. Heitmiller,** Assistant in Chemistry
B.A., 1949, M.S., 1950, University of Delaware

**Richard Jason Hellmann,** Assistant in Chemistry
B.S., 1948, University of Wisconsin
M.S., 1949, University of Illinois

**Arthur Woods Helwig**
Assistant in Chemical Engineering
B.S., 1950, Missouri School of Mines

**Donald Benjamin Hines,** Assistant in Chemistry
B.S., 1950, Southwest Missouri State College

**Richard Leslie Hinman,** Assistant in Chemistry
A.B., 1949, Columbia University

**Herbert Otis House,** Assistant in Chemistry
B.S., 1950, Miami University

**Eleutherios Ted Houvouras,** Assistant in Chemistry
B.S., 1944, University of West Virginia
M.S.Ch.E., 1950, University of Illinois

**Lun Hsiao,** Assistant in Chemistry
B.S., 1939, National Tsing Hua University
M.S., 1948, University of Illinois

**Montfort Anders Johnsen,** Assistant in Chemistry
B.S., 1948, University of Denver
M.S., 1949, University of Colorado

**Ralph Oliver Kerr,** Assistant in Chemistry
A.B., 1949, Indiana University
M.S., 1950, University of Illinois

**Perry Ross Kippur,** Assistant in Chemistry
B.S., 1949, University of Denver
M.S., 1950, University of Illinois

**Theodore Joseph Kneip,** Assistant in Chemistry
B.Chem., 1950, University of Minnesota

**Owen John Koeppe,** Assistant in Chemistry
A.B., 1949, Hope College

**Ruth Evalene Koski,** Assistant in Chemistry
B.S., 1947, Michigan State College
M.S., 1950, University of Illinois

**Herbert Faraday Kraemer**
Assistant in Chemical Engineering
B.Ch.E., 1947, University of Delaware

**Alexander Jerry Kresge,** Assistant in Chemistry
B.A., 1949, Cornell University

**John Ralph Kuebler, Jr.,** Assistant in Chemistry
B.S., 1948, University of Wisconsin
M.S., 1949, University of Illinois

**William Farrand Loranger,** Assistant in Chemistry
B.A., 1947, Denison University
M.S., 1950, University of Illinois

**Elwyn Raymond Lovejoy,** Assistant in Chemistry
A.B., 1949, Boston University
M.S., 1950, University of Illinois

**David Warren McCall,** Assistant in Chemistry
B.S., 1950, University of Wichita

**Fred McCollough, Jr.,** Assistant in Chemistry
A.B., 1950, Wabash College

**Bruce Ritchie McGarvey,** Assistant in Chemistry
B.A., 1950, Carleton College

**Peter Louis Martese,** Assistant in Chemistry
B.S., 1949, Queens College
M.S., 1950, University of Illinois

**Leon Herbert Meyer,** Assistant in Chemistry
B.Ch.E., 1949, Georgia Institute of Technology
M.S., 1950, University of Illinois

**Cal Yale Meyers,** Assistant in Chemistry
A.B., 1948, Cornell University
M.S., 1949, University of Illinois

**Keith Chadwick Murdock,** Assistant in Chemistry
B.A., 1948, M.A., 1950, University of Utah

**Robert Allen Osteryoung,** Assistant in Chemistry
B.S., 1949, Ohio University

**Frederick L. Pundsack,** Assistant in Chemistry
B.S., 1949, University of Illinois

**Robert Ervin Putnam,** Assistant in Chemistry
B.S., 1950, University of Massachusetts

**James Maurice Quinn,** Assistant in Chemistry
B.S., 1950, St. Procopius College

**Ella Louise Richards,** Assistant in Chemistry
B.S., 1947, Wheaton College

**Gene Conrad Robinson,** Assistant in Chemistry
Ph.B., 1947, University of Chicago
M.S., 1949, University of Chicago

**William Gladstone Robinson, Jr.**
Assistant in Chemistry
B.A., 1949, Vanderbilt University

**Roger William Roeske,** Assistant in Chemistry
B.A., 1948, University of Wisconsin
M.S., 1949, University of Illinois

**Arthur Melvin Ross,** Assistant in Chemistry
S.B.Ch.E., 1947, Massachusetts Institute of Technology

**Roger Waldo Sanftner,** Assistant in Chemistry
B.S., 1949, M.S., 1950, University of New Mexico

**Ronald Luther Saxton**
Assistant in Chemical Engineering
B.S., 1950, Pennsylvania State College

**Rolland William Phillip Short**
Assistant in Chemistry
A.B., 1949, James Millikin University
M.S., 1950, University of Illinois

**Homer Jennings Sims,** Assistant in Chemistry
B.S., 1948, M.S., 1948, Western Illinois State College

**William Edward Smith,** Assistant in Chemistry
B.Ch.E., 1945, M.Ch.E., 1947, Rensselaer Polytechnic Institute

**Arthur Allen Smucker,** Assistant in Chemistry
A.B., 1949, Goshen College

**Robert Frederick Sympson,** Assistant in Chemistry
B.S., 1950, Monmouth College

**Irving Robert Tannenbaum,** Assistant in Chemistry
B.S., 1946, M.S., 1947, Virginia Polytechnic Institute

**Norman William Thomas,** Assistant in Chemistry
B.S., 1950, Wayne University

**William Fredrick Ulrich,** Assistant in Chemistry
B.S., 1949, Southern Illinois University

**Robert Floyd Vance,** Assistant in Chemistry
B.S., 1949, Otterbein College
M.S., 1950, University of Illinois

**John Dixon Vaughan,** Assistant in Chemistry
B.S., 1950, College of William and Mary

**John Frederick Walker,** Assistant in Chemistry
B.S., 1949, M.S., 1950, University of Western Ontario

**Kenneth Wark, Jr.**
Assistant in Chemical Engineering
B.S.Ch.E., 1950, Purdue University

**John Kendall Williams,** Assistant in Chemistry
B.S., 1950, Massachusetts Institute of Technology

**Oren Francis Williams,** Assistant in Chemistry
B.Eng., 1943, University of Toledo
M.S., 1947, University of Illinois

**Merle Leslie Winters,** Assistant in Chemistry
B.S., 1949, Northern Illinois State Teachers College

**Dale Earl Woerner,** Assistant in Chemistry
B.S., 1949, Kansas State College

**Owen York, Jr.,** Assistant in Chemistry
B.A., 1948, Evansville College
M.A., 1950, University of Illinois

**William Arthur Ziegler,** Assistant in Chemistry
A.B., 1948, M.S., 1949, University of Illinois

**Paul Albert Zimmerman,** Assistant in Chemistry
A.B., 1941, B.D., 1944, Concordia Seminary
M.A., 1947, University of Illinois

## Graduate Research Assistants

**John Rybolt Allen,** Research Assistant
A.B., 1949, Ball State Teachers College

**Donald Muzzy Beeson**
Ultracentrifuge Research Assistant
B.S., 1948, Kansas State College
M.S., 1950, University of Illinois

**Charles Herbert Benton,** Research Assistant
B.S., 1948, Kansas University

**William Wesley Burr, Jr.**
United States Public Health Research Assistant
B.A., 1947, University of Nebraska
M.S., 1948, University of Illinois

**Kenneth George Clarke,** Research Assistant
B.A., 1949, University of Buffalo

**Saul Mark Cohen,** Research Assistant
B.S., 1948, University of Massachusetts
M.S., 1949, University of Illinois

**James William Currier,** Research Assistant
B.S., 1950, University of Illinois

**James William Curry,** Research Assistant
A.B., 1949, James Millikin University
M.S., 1950, University of Illinois

**Edwin Orlando Davisson,** Research Assistant
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## Operative Staff

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**Lee Whyte,** Laboratory Program Assistant

**L. F. Goodyear,** Glassblower

**Mary L. Murray,** Departmental Stenographer

**Barbara W. Stillman** (Mrs.), Departmental Stenographer

**Lois Michalowski** (Mrs.), Departmental Stenographer

**Wandalou Murphy,** Departmental Stenographer

**Jeanette Morenz,** Departmental Stenographer

**Wilma Misch** (Mrs.), Departmental Stenographer

**Betty L. Raines** (Mrs.), Departmental Stenographer

**Charlotte Gordon,** Departmental Stenographer

**Gracye M. Parks,** Departmental Stenographer

**Marvin T. Murrell,** Storekeeper

**Clifford E. Dalton,** Storekeeper

**Clyde M. Scott,** Storekeeper

**George A. Pittman,** Storekeeper

**Carl S. Coad,** Storekeeper

**Gladson Burton,** Storekeeper

**Elisha N. Genung,** Senior Laboratory Attendant

**Arthur E. Wood,** Senior Laboratory Mechanic

**Clyde W. Powers,** Senior Laboratory Mechanic

**Claude B. Dunn,** Senior Laboratory Mechanic

**Stanley A. Phillips,** Junior Laboratory Mechanic

**Verle F. Walters,** Junior Laboratory Mechanic

**Robert D. Lewis,** Stores Clerk

**Ralph J. Hales,** Stores Clerk

**Russell E. Brown,** Stores Clerk

**John M. Tierney,** Stores Clerk

**Lloyd L. Lafenhagen,** Stores Clerk

**Edward J. Gray,** Stores Clerk

**Glen Percival,** Stores Clerk

**John T. Kink,** Stores Clerk

**Ruth M. Mock** (Mrs.), Assistant Laboratory Attendant

**Staff of the General Chemical Stores**

**L. E. Bailey,** Stores Supervisor

**C. R. McArty,** Storekeeper

**W. S. Lemmon,** Stores Clerk

**T. D. Roberts,** Stores Clerk

## Former Staff Members

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**Robert Cummins Gore** (1937-1942), American Cyanamid Company, Stamford, Connecticut.

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## THE CHEMISTRY DEPARTMENT, 1941-1950

Progress and expansion on the one hand and wartime emergencies on the other have influenced the development of the University of Illinois' department of chemistry during the ten-year period since the publication of the last departmental bulletin.

The urgent research needs of the war years and the rapid increase in enrollment immediately following created major crises. To meet the demands of the war period, many laboratories were devoted to investigations for the government. Teaching programs had to be maintained for the regular students and the service men. After the war, the establishment of the new branches of the University of Illinois at the Navy Pier in Chicago and at Galesburg reduced the number of first- and second-year students at Urbana. But returning veterans and students completing courses at the branches swelled the enrollment in the upper classes and graduate school to an unprecedented total — in spite of the high grade average requirement instituted in 1940.

By 1950, the chemistry faculty had increased to forty-five teaching and research members, ninety-seven assistants, four laboratory technicians, thirty-seven graduate research assistants, and seventy-two fellows — an over-all increase of seventy-four during the ten-year period. Twenty-three of the thirty-eight senior faculty members of 1940 remained through 1950 which has afforded an excellent opportunity for a program of continuous development.

Climax of the ten-year period came with the opening of the long-awaited East Chemistry Building in February of 1950. The project had been delayed for several years by the war and the postwar building problems. Its completion set a milestone in the development of the department at Illinois. With its new facilities, and with its plans for even greater expansion, the department is well equipped to contribute to whatever requirements and advancements the future may bring.

Normalcy in 1951, if that term may be used at

**At Work in the Unit Operations Laboratory**

all, is not the normalcy of 1940. The account of the faculty changes, academic activities, research projects, the remarkable collection of special permanent equipment, and the building program reflect the ten-year period.

## The Laboratories

The housing of the chemistry department exemplifies the growth of the University as well as the increasing contribution of science to contemporary needs. The first chemical laboratory was a room in the basement of the original University building. By 1877, an appropriation of $40,000 was secured from the legislature, and the building now occupied by entomology was erected for the use of the chemistry department. In 1901, a sum of $100,000 was allotted to build the structure that is now the west half of Noyes Laboratory. It was expected that this would last for at least twenty-five years. Far sooner than anticipated a need for expansion was met by the erection of the east side of Noyes Laboratory between 1914 and 1916. Small buildings for experimental work were in operation in the twenties. The Chemistry Annex, designed to accommodate the first- and second-year students, was opened in 1931. But even these units failed to provide adequate space for the expanding research work of students and faculty. The newest structure for the use of the chemistry department is the three-million-dollar East Chemistry Building east of Mathews Avenue, across the street from the Chemistry Annex.

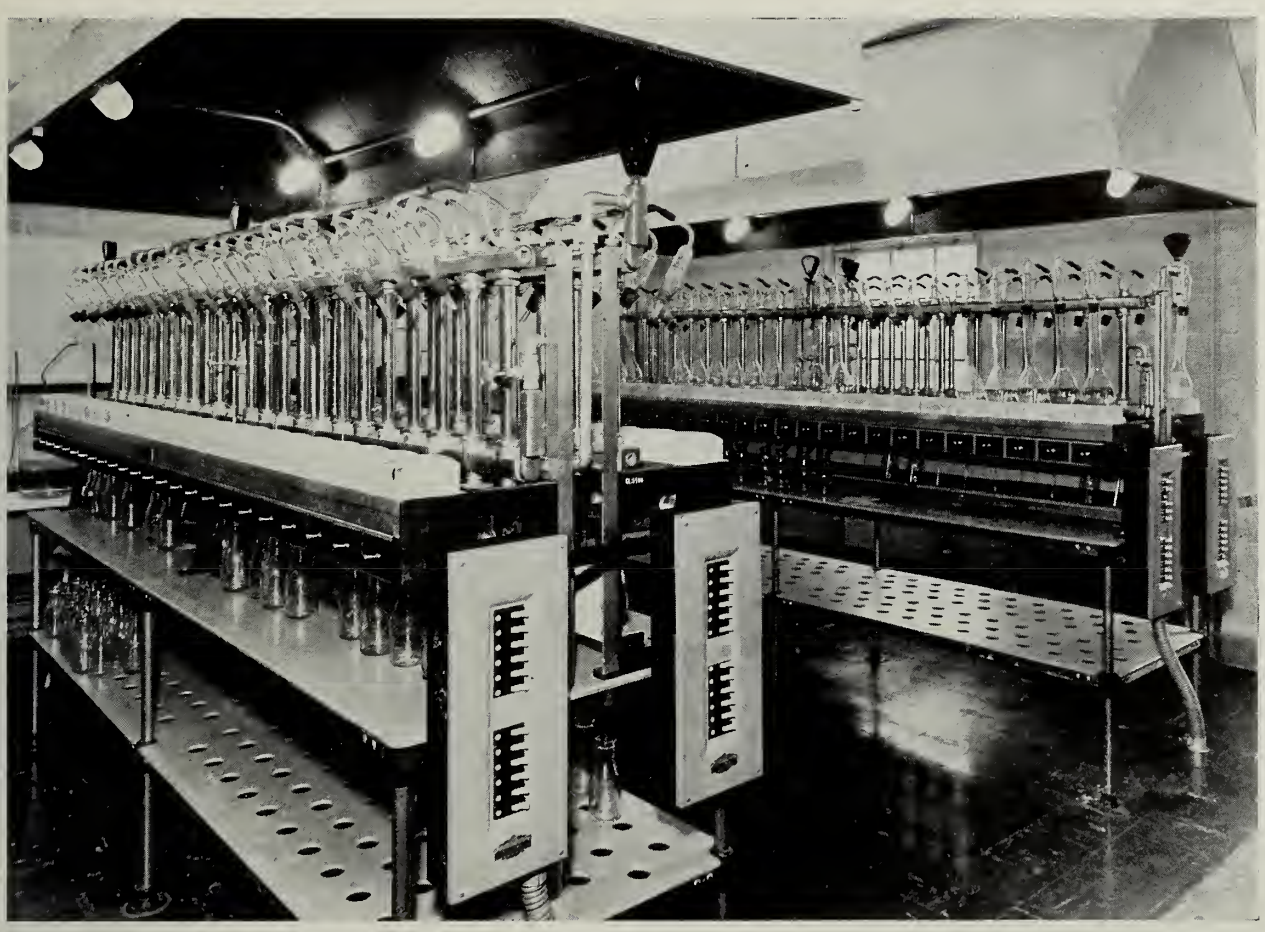
The new East Chemistry Building is the first quarter of a unit which, in the future, may occupy the entire block. Although the diggings for the foundation began in 1946, the delays of postwar building retarded progress. In February, 1950, the structure was ready for occupancy and the divisions of biochemistry and chemical engineering moved into their respective locations. Modern construction and furnishings for the building include the latest devices in the classrooms and laboratories for convenience and efficiency.

An outstanding feature for the chemical engineering division is the unit operations laboratory with head-space of three full floors. Mezzanine floors made of open steel grillwork are built around the sides of this large room. Tall structures erected through these floors may be inspected at different levels. On each floor, easily-accessible service lines for cold water, air, vacuum, hot water, high and low pressure steam, and 120-volt AC with sixty-amperes capacity are at hand. There is also a DC panel. Compressors and high capacity blowers provide air for the equipment.

Above the unit operations room, there is a pilot laboratory extending through the third and fourth floors of the building. Removable steel plates allow for four- by eight-foot openings in the main floor of the pilot laboratory and there are movable sections of the same size in the grillwork of the balconies of the unit operations laboratory immediately below. By this means, equipment up to seventy-nine feet in height can be put in place. A unit process or projects laboratory on the first and second floors adjacent to the unit operations room provides space for training a class of one hundred and fifty students. Nitrators, sulfonators, extractors, and a distillation column have been installed. With the new facilities, students not only learn to operate the permanent units but may use the available space for the design and erection of special equipment in connection with research problems.

Chemical engineering has a measurement and instrumentation laboratory which contains apparatus for the study of temperature, rates of flow and liquid levels, and the means for controlling these quantities. In the high pressure laboratory, the study of physical properties of gases and liquids and chemical reactions may be performed under pressures running as high as 150,000 pounds per square inch or up to 10,000 atmospheres. The electrochemical laboratory, in addition to standard operational units, has a small industrial electroplating plant. A special laboratory for the study of boiler water-conditioning for corrosion prevention, embrittlement, and deposits is available, as well as a refrigeration system, low temperature rooms, compressors, furnaces, constant temperature and humidity rooms, a grinding and crushing laboratory, instrument laboratory, photographic rooms, drafting rooms, a seminar and club, and locker and shower rooms. Occupying the basement and the first two floors, the chemical engineering division has twenty offices, thirteen laboratories, three classrooms, and six computation rooms.

Except for the centrally located area of the chemical engineering pilot plant room, the third and fourth floors of the new building are devoted to biochemistry. Space is provided for five staff offices, five postdoctorate and seven graduate student research



**Kjeldahl Distillation Facilities**

laboratories, and five large laboratories for course work. The two laboratories for elementary biochemistry can accommodate two hundred and forty-seven students. The seminar room has ample space for forty participants.

Special needs of the biochemical division are met by two Kjeldahl rooms, a well-equipped kitchen and metabolism room for human dietary studies, a constant temperature room, refrigeration and low temperature rooms, dark room, rooms for mills, an optical unit, balances, microbiological assay, valuable permanent instruments, gas analysis, and heavy equipment. There is a special extraction room in which the light fixtures and electric switches are explosion-proof so that any organic solvent may be used. Extra ventilation has been arranged to take care of waste vapors. One section of the fourth floor has been set aside for air-conditioned animal rooms, with arrangements for housing stock animals, animal runways, operating, breeding, and rat experiments. Both the flat-top roof and a flat area off the third floor may be utilized for open-air experiments. The floor plans will show details of the general arrangement.

After the removal of chemical engineering and biochemistry to the new East Chemistry Building and the State Water Survey to the Water Resources Building, the vacated space in Noyes Laboratory was reassigned and reconstructed for new occupants. Perhaps the most striking physical alterations are the new fireproof stairways at the north and south ends of the building. The central wooden stairway has been replaced by storerooms on the first and second floors, and by a classroom on the third floor. To expand the overcrowded library, an inner stairway connecting the main room to the old museum-classroom below allows its use as a graduate study room with additional stacks for bound journals.

The analytical division has had its third floor rooms reconditioned for particular projects. In the

basement, it is using the south side for X-ray work, the electron microscopes and other permanent equipment, and an advanced microanalytical teaching laboratory. Increased emphasis on instrumental analysis has resulted in a remarkable assemblage of specialized instruments for this division, including three electron microscopes, a Cary recording spectrophotometer, and all types of polarographic and X-ray equipment.

The inorganic division has expanded into the south laboratories on the third floor. The division now is equipped for advanced work with a spectrophotometer, apparatus for thermal analysis, and apparatus for handling gases in closed systems.

The organic division now fills the entire second floor except for the library. Special apparatus has been set up in the laboratories including equipment for chromatographic separation of organic acids, polymerization equipment, a Podbelniak still, and apparatus for ozonization. A large basement room has been remodeled for organic chemical manufactures. The central organic storeroom, completely modernized, stocks over three thousand organic chemicals. Organic chemistry also occupies the east half of the fourth floor, and the department of bacteriology has been given the west side of this floor which was formerly occupied by the biochemistry division.

Physical chemistry increased its quarters by reconstructing the rooms formerly held by the State Water Survey to prepare needed laboratories and offices. Special equipment, primarily for work in the physical division, is available. A well-equipped radiochemical laboratory, radioactive counter, a room for nuclear magnetic radiofrequency spectroscopic work, the infrared spectroscope, a molecular beam apparatus, light scattering apparatus, diffusion apparatus, and the ultracentrifuge are in operation.

The microanalytical laboratories on the first floor court area have been improved and air-conditioned for increased convenience and efficiency. A storeroom on the third floor is unique in being not only the source of equipment supply but a repair shop as well.

The function of the Chemistry Annex to house the elementary inorganic and analytical laboratories remains the same, but, as for many years, at least one laboratory has been given over to the organic division. The Annex office has become the established center for personnel work and headquarters for visiting representatives from the industry who wish to interview candidates for employment.

## Inter-departmental Research Programs

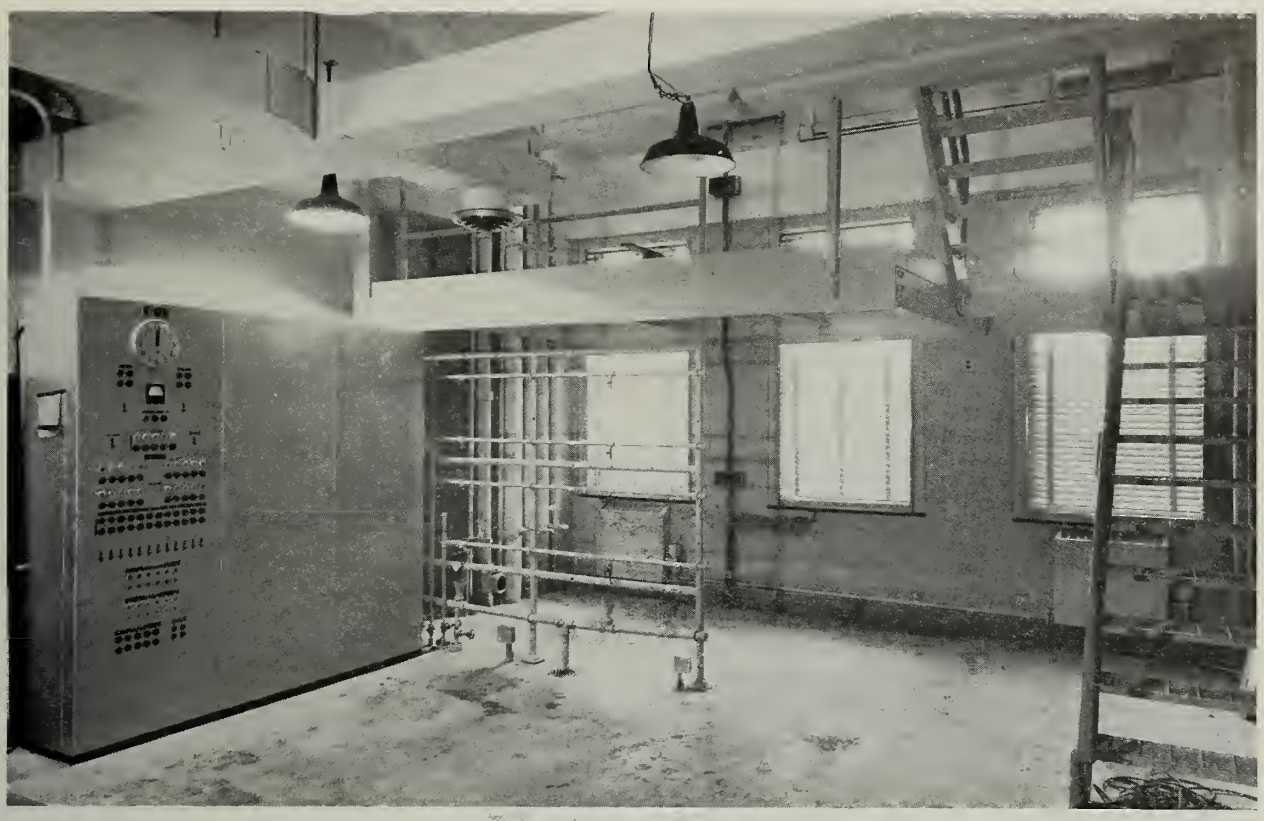
With the increased development of laboratory facilities, permanent equipment of a highly specialized character and of potential use in fields other than chemistry has become part of the assets of the chemistry department. To avoid duplication elsewhere on the campus, several services under the management of members of the chemistry faculty have been established for utilization by faculty members from other departments who require special research data. The large number of cooperative projects already underway indicates the value of this arrangement.

The physical chemistry division's equipment for infrared spectrographic work is being used in cooperation with the bacteriology department in studies of the structure of molecules from liver extract, and in the study of the structure of vitamin-like materials in wheat germ oil for the food technology staff. An ultracentrifuge and a mass spectrograph for isotopic studies are available. The animal nutrition department will use the mass spectrograph for nitrogen analyses and the physics department has requested verifications of the purity of gases.

Recent investigations by the analytical division included studies of new viruses for plant physiology, bacteriology, and physiology at the medical school in Chicago. The theoretical and applied mechanics staff presented problems in metallurgy; geology and the State Geological Survey are interested in the examination of clays and soils; and the physics department, in colloids.

A member of the biochemistry faculty has charge of the electrophoresis equipment which has been used in collaboration with the College of Veterinary Medicine to help identify immune globulins from chicken serum in relation to Newcastle's disease, and with the bacteriologists for the study of the number of components in enzyme preparations. The radiocarbon laboratory is producing work on nicotinic acid with $C^{14}$ for animal nutrition, studies of labeled substrates with $C^{14}$ for the State Water Survey, and on some fermentation experiments in cooperation with the bacteriology department.

In addition, work on a university professional courtesy basis has been done for investigators from all parts of the world.



**Pilot Plant Laboratory**

## Faculty and Administrative Changes

Since 1937, Professor John C. Bailar, Jr., has been secretary of the department, with duties including the examination of the applications for fellowships and scholarships, the complicated details of the placement service for students, and direction of the department during the summer session. Professor Bailar was appointed head of the inorganic division when Professor B Smith Hopkins retired in 1941.

From 1926 until the fall of 1945, Professor Donald Babcock Keyes, Professor Parr's successor, directed the teaching program and was responsible for many special and commercial research projects in the division of chemical engineering. The publication listings of the department during this period indicate the diversity of the lines of investigation. Professor H. Fraser Johnstone assumed the headship of the division when Professor Keyes resigned, in 1945, to join the Heyden Corporation in New York City.

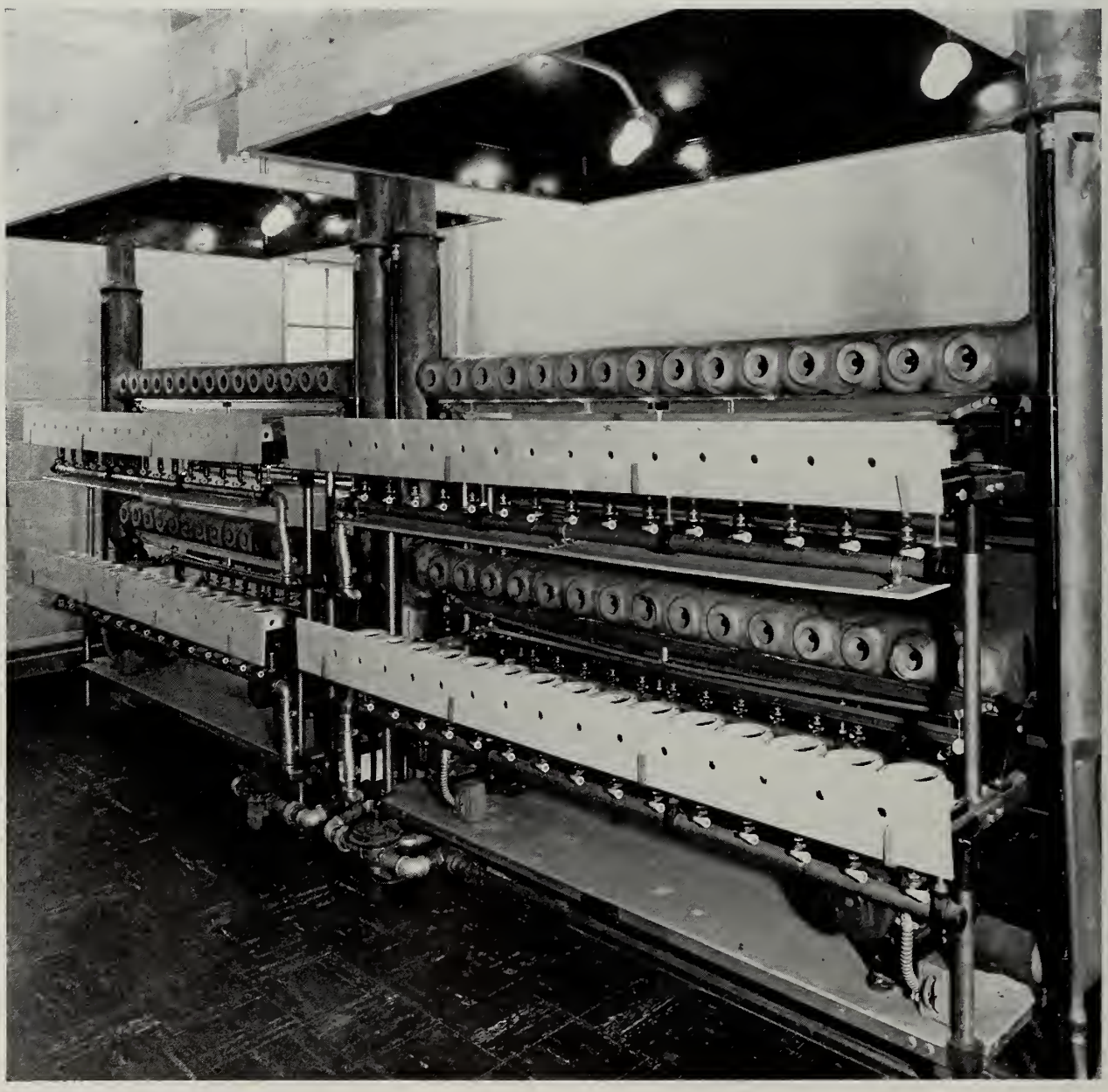
Professor R. L. Shriner, who had joined the staff in 1927, resigned to become head of the chemistry department of the University of Indiana in 1942. During his fifteen years at Illinois he had done productive work in many fields of organic chemistry, including drugs, alkaloids, local anesthetics, urethanes, sulfones, sulfoxides, sulfanilides, mutarotation, coumarones, flavylium salts, and anthocyanins. In 1946, Professor C. C. Price became head of the chemistry department at Notre Dame. He had been active in the anti-malarial laboratory here during the war.

Professor Robert L. Frank, a member of the organic division, was appointed research director for the Edwal Laboratories at Ringwood, Illinois, in the fall of 1950. His research work here included organic syntheses, polymerization and synthetic rubber, synthesis and chemistry of pyridine derivatives; synthesis of monocyclic terpenes, and chemistry of fungi and lichens.

Professor William Albert Noyes died on October 24, 1941, just before his eighty-fourth birthday. The last departmental bulletin, issued while he was still living, contained a tribute to him and an account of his accomplishments. For all who knew him at Illinois and for all those connected with the laboratory which bears his name, his great contributions

to American chemistry stand as a source of pride and inspiration.

On September 1, 1946, after twenty-eight years of service to the chemistry department, Professor John Henry Reedy retired. On coming to the University of Illinois in the fall of 1918, he taught inorganic chemistry, which led directly to the organization of a course in the study of the metallic elements for engineers. Professor Reedy's publications include two well-known texts, *Elementary Qualitative Analysis for College Students,* which has had three successful editions, and *Theoretical Qualitative Analysis.* His research problems were those of the inorganic and analytical chemist in connection with improvements in micro and semi-micro methods for qualitative analysis, studies on mechanism and rates of reaction, and polymorphism. Professor Reedy died on February 21, 1950. He will be remembered as an excellent teacher and warm friend by all Illinois students who knew him.



**Kjeldahl Digestion Facilities**

The chemistry department lost one of the most gifted of its younger men when Professor Elliot Ritchie Alexander died in an airplane accident, October 23, 1950. His published papers and his book, *Principles of Ionic Organic Reactions,* are listed with the publications of this department. Professor Alexander's researches were devoted chiefly to the mechanism of organic reactions, such as sulfonation, the Cannizzaro, Leuchart, Chugaev and Mannich reactions, the pinacol and Claisen rearrangements, and the nature of conjugate additions.

Present addresses of senior faculty members during the past decade who are now elsewhere are listed on page 19. Their contribution to the progress of the chemistry department is incalculable, and their colleagues at Illinois remember them with appreciation.

## The War Period

World War II changed the types of research, the laboratories, and the teaching duties in the department for several years. Professor Roger Adams was asked to become a member of the National Defense Research Committee and was granted a leave of absence for the duration. Professor W. C. Rose assumed the duties of acting head of the department from 1942 until 1946. Five senior staff members in the Officers Reserve Corps of the Army were called to active duty.

While many of the senior staff were called upon for war work away from Urbana, others supervised work in the laboratories here which had been placed at the disposal of government-sponsored research programs. Several large projects — including synthetic

**Chemical Engineering Projects Laboratory**

rubber investigation, anti-malarial drug work, munitions research on colored and screening smokes and toxic gases, detection of poisons in water and treatments for their removal — were developed through the cooperative efforts of staff and students. Contributions were made to the Manhattan project, penicillin research, public health, and many other problems. Work proceeded at full capacity and full speed on all assignments.

Meanwhile, enrollment in the elementary courses increased with the Army and Navy programs at the University. Professor B S. Hopkins, who had retired, consented to take charge of the elementary chemistry classes for the Army Student Training Program. Professor D. R. Martin organized the classes for the Navy V-12 units. Extra lecturers were employed for trainees who could not attend on the regular semester basis. For the benefit of the war industries, new courses in X-ray technique were offered, and a special course on rubber and synthetic rubber was introduced for the graduate students.

## Professional Organizations

The professional organizations are supported by the faculty and students to promote professional achievement and fellowship within the chemistry department. The monthly meetings of the University of Illinois section of the American Chemical Society bring noteworthy speakers to the campus. Phi Lambda Upsilon, Alpha Chi Sigma, Iota Sigma Pi, and the University of Illinois chapter of the American Institute of Chemical Engineers continue to stimulate professional activity.

The jubilee commemorating the fiftieth anniversary of the founding of Phi Lambda Upsilon at the University of Illinois was held on April 9, 1949. Members of the faculty and the active chapter, the national officers, and delegates from many of the neighboring institutions attended. The chapter decided to sponsor a similar event annually which would stimulate the same spirit of scientific service and good fellowship. This led to the establishment of an annual lectureship, to be known as the William Albert Noyes Lectureship in Chemistry, sponsored by the Alpha chapter in cooperation with the department of chemistry. Professor William Albert Noyes, Jr., of the University of Rochester, was selected in 1950 as the first speaker for the award and distinction.

University of Illinois students have won more prizes than those from any other university in the national student contest sponsored annually by the committee on student chapters of the American Institute of Chemical Engineers. The complete list of Illinois winners is given below:

| | | | |
|---|---|---|---|
| 1st Prize | A. MacLaren White Award | 1933 | Roy S. Arrandale |
| | A. MacLaren White Award | 1934 | Robert V. Lukes |
| | A. MacLaren White Award | 1942 | Charles C. Neas |
| | A. MacLaren White Award | 1949 | W. E. Henderson |
| | A. MacLaren White Award | 1950 | Robert P. Bannon |
| 2nd Prize | | 1937 | Earp F. Jennings, Jr. |
| | | 1939 | Robert C. Holmes |
| 3rd Prize | | 1949 | F. Wallace Crawford |
| 4th Prize | | 1937 | Verne Lloyd Simril |
| 5th Prize | | 1937 | Donald W. Wroughton |
| Honorable Mention | | 1941 | Craig Yacoe |

## Operative Staff Changes

The members of the operative staff are an integral part of the chemistry department since their assistance is indispensable to the effective operation of the whole organization. Several of this group, well known to Illinois graduates, have retired.

Mr. Justa M. Lindgren, who was director of the Applied Testing Laboratory for many years, retired in 1946. He was employed by the State Water Survey in 1904, and in 1907 began work for Professor Parr as an analyst. In the latter position, he carried out coal analyses in connection with a state-wide survey of Illinois coals. Investigations associated with specifications for materials used by the University were instituted and the laboratory for technical analysis developed as a service for that type of work. Mr. Lindgren made valuable contributions to the Bureau of Standards relating to the analysis of steel and burned-refractories. He was appointed the supervisor of the staff of the chemistry storerooms in 1926. Following Mr. Lindgren's retirement, Professor G. F. Smith was relieved of part of his teaching duties to direct the work of the Applied Testing Laboratory.

Mrs. Edna V. Evans, competent executive clerk and secretary to the head of the department, retired in 1948, after twenty-three years of service. Mr. C. F. Miller, who was brought to Illinois in 1907 by Professor Noyes, had charge of purchasing supplies as chief clerk until August, 1948. Mr. W. L. Bennett, a graduate of Illinois in agronomy in 1902, became the stock record clerk in the General Chemical Stores when they were organized. He served the University from 1909 until his death, on December 15, 1944.

Mr. C. C. Crawford was a member of the operative staff from 1909 until a year or two before his

death in 1948. At that time he was on leave of absence from his work. Mr. Paul Anders, who joined the department in 1914, retired in 1947 from his unique position as practical operator and teacher in the art of glassblowing. Forrest Mock was employed in the storerooms from 1913 to 1946. Mr. Mock's accuracy in the dispensing room for qualitative analysis is legendary. Mr. L. E. Tillotson carried out the duties of storekeeper from 1923 to 1946. Miss Ida Zimmerman, who served as chief clerk and secretary to the head of the department from 1948 to 1951, directed the main office in an admirable manner. She resigned in February, 1951, and her place was taken by Mrs. Elsie M. Wilson. The chemistry department owes much to this group for its loyalty and efficiency. The present members of this staff are listed on page 18.

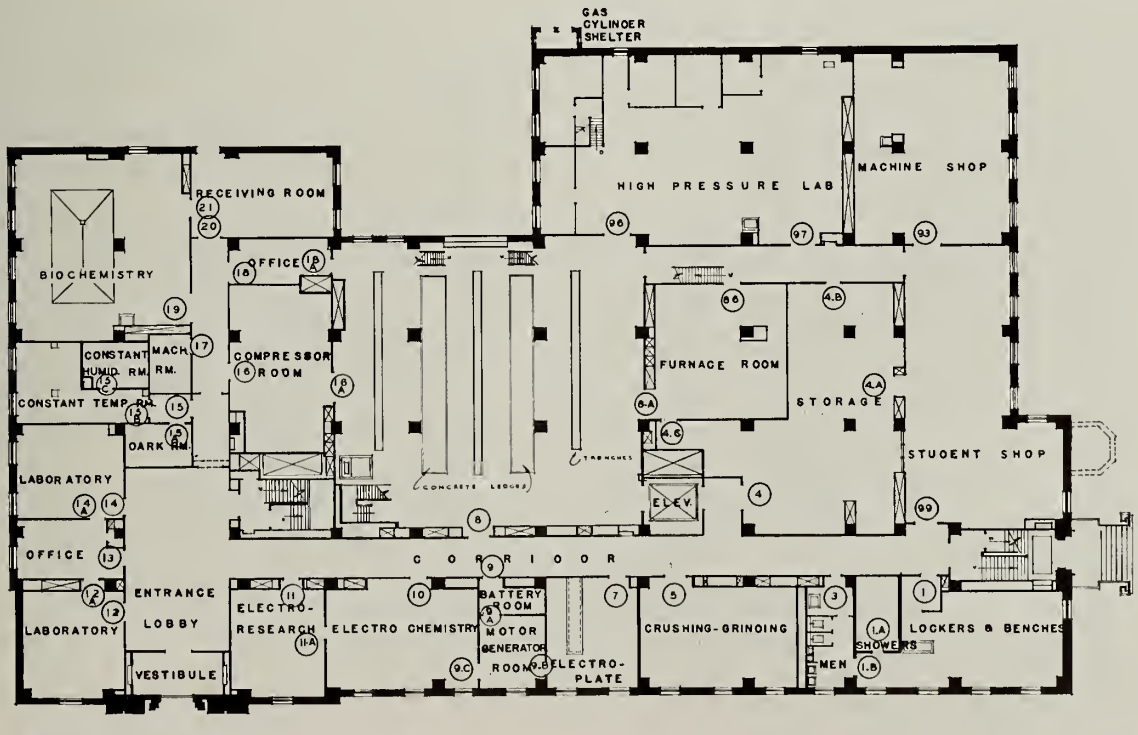
## Enrollment

The fluctuations of the total class enrollment figures for this past decade, as shown in the table, speak for themselves. The influence of the war and the returning veterans is quite apparent. The grade-average requirements are still in force with a modification for those students who enter Graduate College.

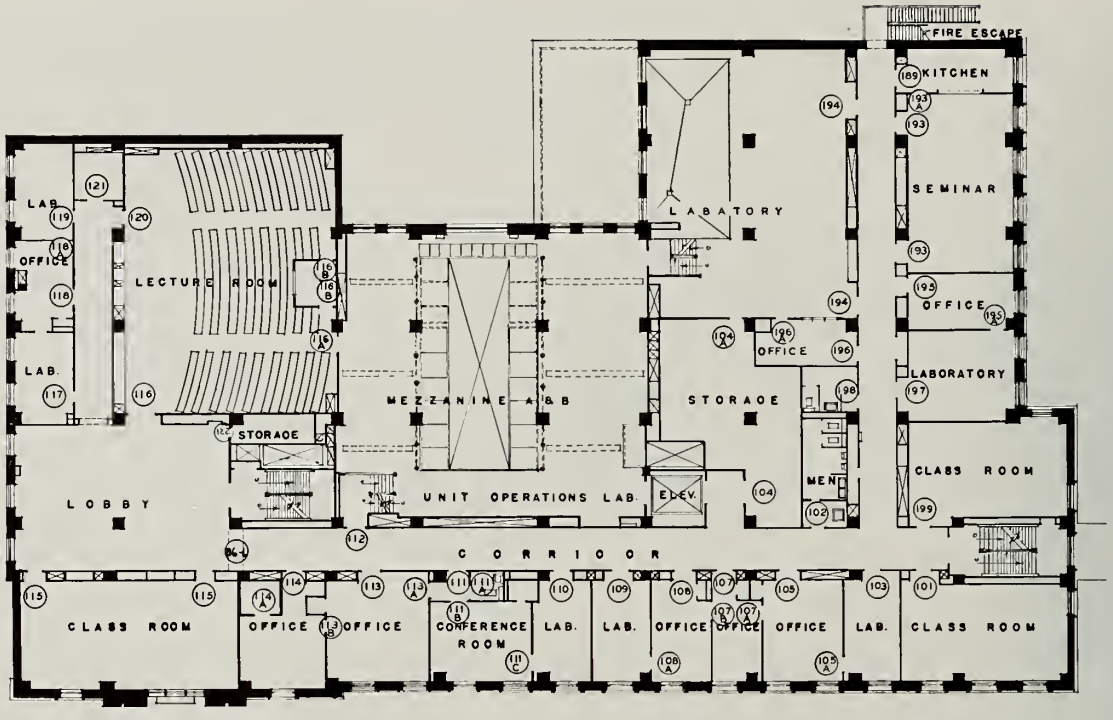
**Enrollment in Chemistry Courses, 1940-1950**

| | ENROLLMENT | | GRADUATE STUDENTS | |
|---|---|---|---|---|
| | First Semester | Second Semester | First Semester | Second Semester |
| 1940-1941 | 4621 | 3729 | 199 | 185 |
| 1941-1942 | 4070 | 3351 | 185 | 174 |
| 1942-1943 | 4091 | 2989 | 159 | 153 |
| 1943-1944 | 1896 | 1385 | 141 | 140 |
| 1944-1945 | 1669 | 1430 | 89 | 87 |
| 1945-1946 | 2244 | 3430 | 113 | 163 |
| 1946-1947 | 5321 | 4837 | 250 | 265 |
| 1947-1948 | 5116 | 4443 | 306 | 290 |
| 1948-1949 | 4907 | 4132 | 311 | 298 |
| 1949-1950 | 4644 | 4021 | 293 | 282 |
| 1950-1951 | 4095 | 3504 | 304 | 289 |

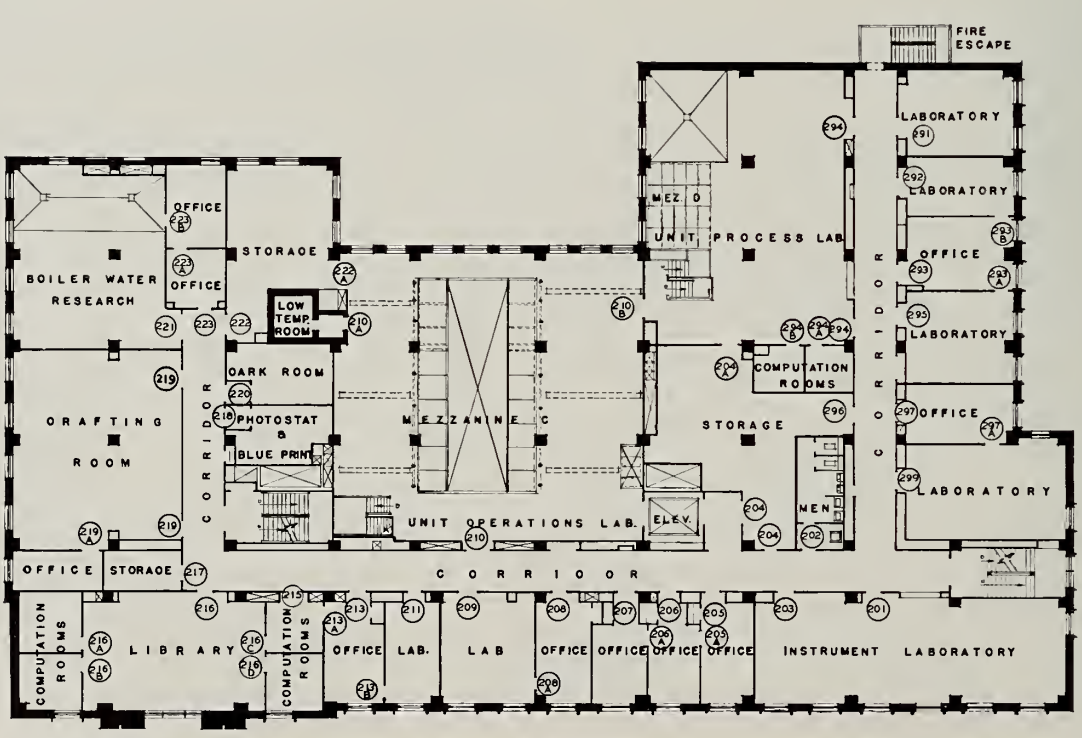
**FLOOR PLANS FOR THE EAST CHEMISTRY BUILDING**



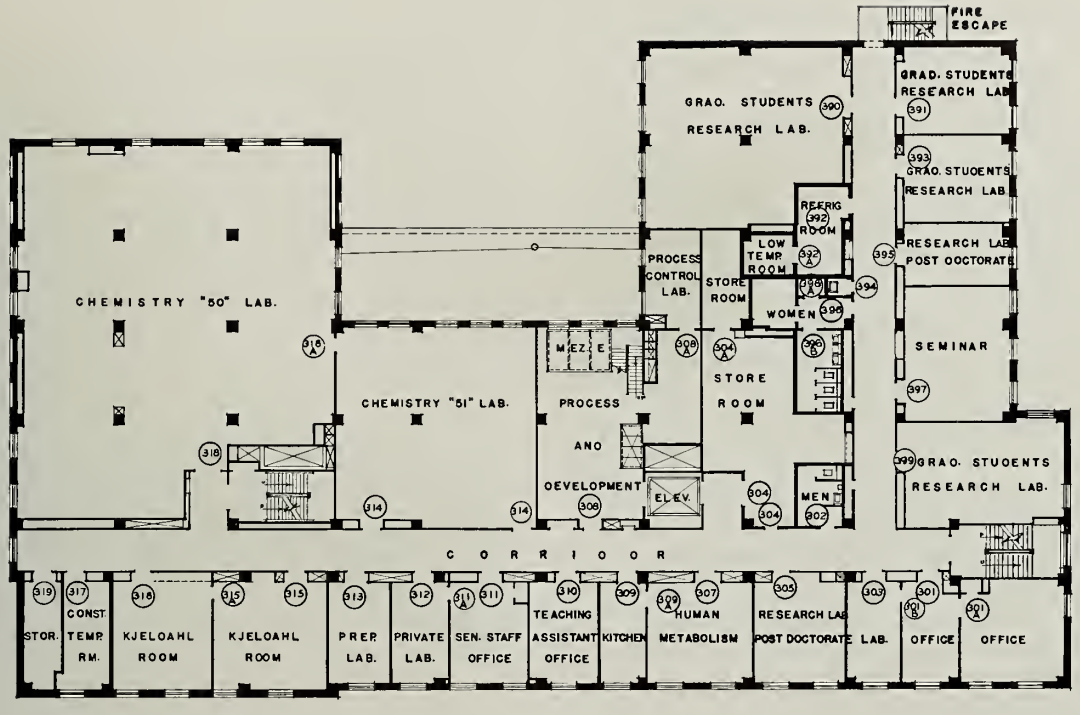

GROUND FLOOR PLAN



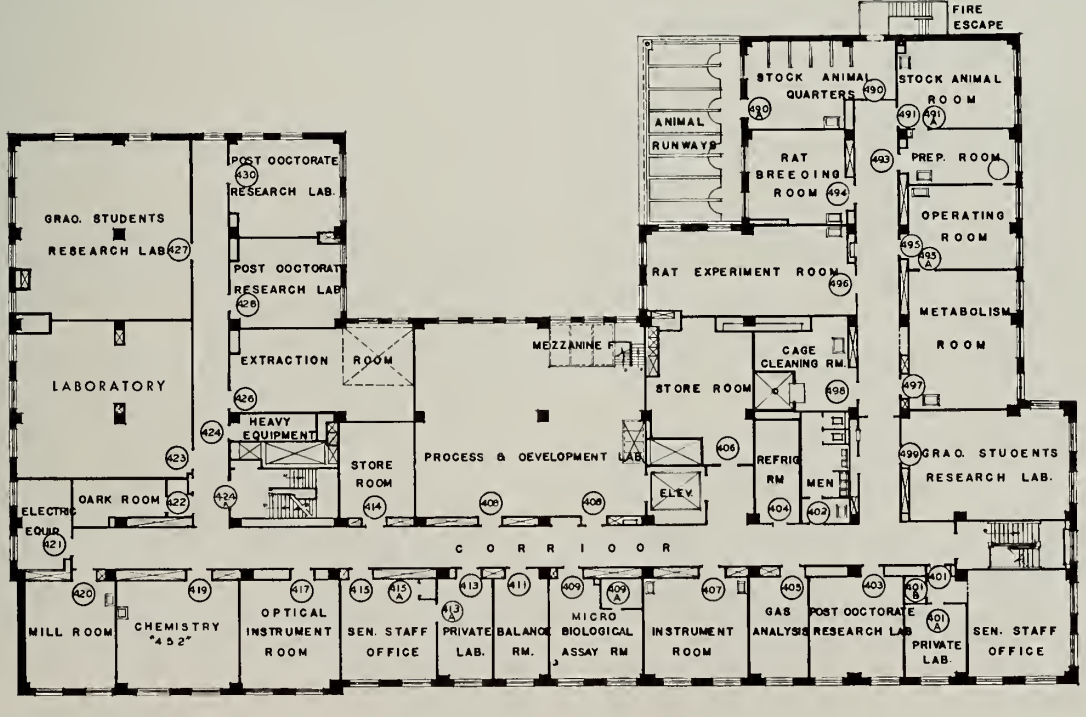

FIRST FLOOR PLAN




SECOND FLOOR PLAN




THIRD FLOOR PLAN N




FOURTH FLOOR PLAN N

# UNDERGRADUATE CURRICULA, 1950-1951[1]

Chemistry may be chosen as a major subject in the general curriculum of the College of Liberal Arts and Sciences, as a minor subject, or as an elective independent of the major and minor subjects. To qualify as major, the student must take twenty hours of chemistry, excluding Chemistry 101, 102, 103, 104, 105, 106, 107, 108, and including courses in qualitative, quantitative, and organic chemistry. At least five hours must be chosen from courses in the 300 group. The corresponding minor requires twenty hours in not more than two of the following: bacteriology, botany, ceramic engineering, entomology, geology, mathematics, philosophy, physics, physiology, psychology, and zoology. At least eight hours must be taken in each subject if two are chosen.

Students of junior standing who choose chemistry as a major subject or who seek registration in any of the chemistry curricula must have a 3.5 general average. Students registered in Chemistry 290 or Chemical Engineering 290 automatically become candidates for honors. All other students in the chemistry or chemical engineering curriculum or majors in chemistry who have a 4.0 average or better are eligible to become candidates for honors, provided they signify their intentions in writing to their adviser, preferably at the time of registration in the first semester of their senior year, but not later than at time of registration for the second semester. This declaration of intention by the student shall be accompanied by registration in certain specific courses. The candidates will be required to supplement the regular work of the course with special assignments by the instructor. The final recommendation for honors will be based chiefly upon the previous record and the performance in the selected course.

The minimum language requirement for graduation is the equivalent of two years of college work in German or French, or one year in each. A student who has had two years of French or German in high school should study the other language in the University. (Russian may be substituted for French.) When a student does not offer either German or French for entrance, the second year of the language required for graduation may be counted as an elective in the chemistry curriculum.

For more specialized training than is required of students who make chemistry their major subject in the general curriculum, the following separate curricula are offered in chemistry, chemical engineering, and the teaching of chemistry, under the administration of the College of Liberal Arts and Sciences.

[1] Graduate course and requirements for advanced degrees are discussed on page 41.

## Curriculum in Chemistry

*For the Degree of Bachelor of Science in Chemistry*

### First Year

| First Semester | Hours | Second Semester | Hours |
|---|---|---|---|
| Chem. 107 — General Chemistry and Qualitative Analysis | 5 | Chem. 108 — General Chemistry and Qualitative Analysis | 5 |
| German or French | 4 | German or French | 4 |
| Math. 117 — Combined Freshman Mathematics | 5 | Hygiene 101 — Health Lectures | 2 |
| Rhet. 101 — Rhetoric and Composition | 3 | Math. 127 — Combined Freshman Mathematics | 4 |
| Physical Education | (1) | Rhet. 102 — Rhetoric and Composition | 3 |
| Military (men) | (1) | Physical Education | (1) |
| | | Military (men) | (1) |
| Total | 17 | Total | 18 |

### Second Year

| | | | |
|---|---|---|---|
| Chem. 124 — Quantitative Analysis | 5 | Chem. 234 — Organic Chemistry | 5 |
| Math. 137 — Calculus | 3 | Math. 147 — Calculus | 3 |
| Physics 103 — General Physics (Mechanics, Heat, and Sound) | 5 | Physics 104 — General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| Physical Education | (1) | Physical Education | (1) |
| Military (men) | (1) | Military (men) | (1) |
| Electives | 3 | Electives | 2 |
| Total | 16 | Total | 15 |

### Third Year

| First Semester | Hours |
|---|---|
| Chem. 240 — Elementary Physical Chemistry | 3 |
| Chem. 241 — Elementary Physical Chemistry Laboratory | 1 |
| Chem. 292 — Chemical Literature and Reference Work | 1 |
| Chem. 336 — Organic Chemistry | 3 |
| Chem. 337 — Organic Chemistry Laboratory | 2 |
| Econ. 108 — Elements of Economics | 3 |
| Electives | 3 |
| Total | 16 |

| Second Semester | Hours |
|---|---|
| Chem. 294 — Chemical Literature and Reference Work | 1 |
| Chem. 342 — Elementary Physical Chemistry | 3 |
| Chem. 343 — Elementary Physical Chemistry Laboratory | 1 |
| Electives | 11 |
| Total | 16 |

### Fourth Year

| | |
|---|---|
| Chem. 327 — Special and Instrumental Methods of Analysis | 3 |
| Chem. 395 — History of Science with Particular Reference to Chemistry | 2 |
| Electives | 11 |
| Total | 16 |

| | |
|---|---|
| Electives | 16 |
| Total | 16 |

## Curriculum in Chemical Engineering

*For the Degree of Bachelor of Science in Chemical Engineering*

An optional four-year curriculum in chemical engineering is available for students who are especially interested in the field of industrial fermentation, pharmaceutical, and biochemical manufacturing industries. Students who enter without adequate preparation in chemistry, mathematics, and languages will find it difficult to complete either of the curricula in chemical engineering in four years. An optional five-year program is available and is recommended especially for those who plan to seek positions in sales, technical service, and administration in the chemical industry, and who wish to broaden their technical training through courses in the humanities, economics, and labor and business administration. All three curricula lead to the degree of Bachelor of Science in Chemical Engineering.

### First Year

| First Semester | Hours |
|---|---|
| Chem. 107 — General Chemistry and Qualitative Analysis | 5 |
| German, French, or Russian | 4 |
| Math. 117 — Combined Freshman Mathematics | 5 |
| Rhet. 101 — Rhetoric and Composition | 3 |
| Physical Education | (1) |
| Military (men) | (1) |
| Total | 17 |

| Second Semester | Hours |
|---|---|
| Chem. 108 — General Chemistry and Qualitative Analysis | 5 |
| German, French, or Russian | 4 |
| Hygiene 101 — Health Lectures | 2 |
| Math. 127 — Combined Freshman Mathematics | 4 |
| Rhet. 102 — Rhetoric and Composition | 3 |
| Physical Education | (1) |
| Military (men) | (1) |
| Total | 18 |

### Second Year

| | |
|---|---|
| Chem. 124 — Quantitative Analysis | 5 |
| G.E.D. 106 — Elements of Drawing | 3 |
| Math. 137 — Calculus | 3 |
| Physics 103 — General Physics (Mechanics, Heat, and Sound) | 5 |
| Physical Education | (1) |
| Military (men) | (1) |
| Total | 16 |

| | |
|---|---|
| Chem. 240 — Elementary Physical Chemistry | 3 |
| Chem. 241 — Elementary Physical Chemistry Laboratory | 1 |
| General Studies Electives | 3 |
| Math. 147 — Calculus | 3 |
| Physics 104 — General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| T.A.M. 150 — Analytical Mechanics (Statics) | 2 |
| Physical Education | (1) |
| Military (men) | (1) |
| Total | 17 |

### Third Year

| First Semester | Hours |
|---|---|
| Ch.E. 261 — Stoichiometry | 3 |
| Ch.E. 267 — Measurements and Instrumentation Laboratory | 2 |
| Chem. 234 — Organic Chemistry | 5 |
| Chem. 342 — Elementary Physical Chemistry | 3 |
| General Studies Electives | 3 |
| Total | 16 |

| Second Semester | Hours |
|---|---|
| Ch.E. 370 — Chemical Engineering Thermodynamics | 3 |
| Ch.E. 371 — Principles of Chemical Engineering | 4 |
| Ch.E. 372 — Unit Operations Laboratory | 2 |
| Chem. 336 — Organic Chemistry | 3 |
| Chem. 337 — Organic Chemistry Laboratory | 2 |
| T.A.M. 221 — Resistance of Materials | 3 |
| T.A.M. 223 — Resistance of Materials Laboratory | 1 |
| Total | 18 |

### Fourth Year

| | |
|---|---|
| Ch.E. 266 — Inspection Trip | ½ |
| Ch.E. 373 — Principles of Chemical Engineering | 4 |
| Ch.E. 374 — Unit Operations Laboratory | 2 |
| Chem. 344 — Principles of Chemical Thermodynamics | 2 |
| E.E. 306 — Direct and Alternating Current Circuits | 3 |
| E.E. 307 — Direct and Alternating Current Laboratory | 1 |
| M.E. 204 — Mechanical Engineering Laboratory | 2 |
| Electives | 2 or 3 |
| Total | 16½ or 17½ |

| | |
|---|---|
| Ch.E. 266 — Inspection Trip | ½ |
| Ch.E. 377 — Chemical Engineering Technology | 3 |
| Ch.E. 379 — Chemical Engineering Projects | 2 |
| Ch.E. 381 — Chemical Engineering Plant Design | 3 |
| E.E. 308 — Direct and Alternating Current Apparatus | 3 |
| E.E. 309 — Direct and Alternating Current Laboratory | 1 |
| Electives | 4 or 5 |
| Total | 16½ or 17½ |

## Optional Curriculum in Bioengineering

*For the Degree of Bachelor of Science in Chemical Engineering*

### First Year

| First Semester | Hours |
|---|---|
| Chem. 107 — General Chemistry and Qualitative Analysis | 5 |
| German, French, or Russian | 4 |
| Math. 117 — Combined Freshman Mathematics | 5 |
| Rhet. 101 — Rhetoric and Composition | 3 |
| Physical Education | (1) |
| Military (men) | (1) |
| Total | 19 |

| Second Semester | Hours |
|---|---|
| Chem. 108 — General Chemistry and Qualitative Analysis | 5 |
| German, French, or Russian | 4 |
| Math. 127 — Combined Freshman Mathematics | 4 |
| Rhet. 102 — Rhetoric and Composition | 3 |
| Hygiene 101 — Health Lectures | 2 |
| Physical Education | (1) |
| Military (men) | (1) |
| Total | 20 |

### Second Year

| | |
|---|---|
| Chem. 124 — Quantitative Analysis | 5 |
| G.E.D. 106 — Elements of Drawing | 3 |
| Math. 137 — Calculus | 3 |
| Physics 103 — General Physics (Mechanics, Heat, and Sound) | 5 |
| Physical Education | (1) |
| Military (men) | (1) |
| Total | 18 |

| | |
|---|---|
| General Studies Electives | 3 |
| Chem. 240 — Elementary Physical Chemistry | 3 |
| Chem. 241 — Elementary Physical Chemistry Laboratory | 1 |
| Math. 147 — Calculus | 3 |
| Physics 104 — General Physics (Electricity, Magnetism, Light, and Modern Physics) | 5 |
| T.A.M. 150 — Analytical Mechanics (Statics) | 2 |
| Physical Education | (1) |
| Military (men) | (1) |
| Total | 19 |

### Third Year

| First Semester | Hours |
|---|---|
| Bact. 320 — General Bacteriology | 5 |
| Ch.E. 261 — Stoichiometry | 3 |
| Chem. 234 — Organic Chemistry | 5 |
| General Studies Electives | 3 |
| Total | 16 |

| Second Semester | Hours |
|---|---|
| Ch.E. 370 — Chemical Engineering Thermodynamics | 3 |
| Ch.E. 371 — Principles of Chemical Engineering | 4 |
| Ch.E. 372 — Unit Operations Laboratory | 2 |
| Chem. 336 — Organic Chemistry | 3 |
| Chem. 350 — Biochemistry | 5 |
| Total | 17 |

### Fourth Year

| | |
|---|---|
| Ch.E. 266 — Inspection Trip | ½ |
| Ch.E. 373 — Principles of Chemical Engineering | 4 |
| Ch.E. 385 — Bioengineering | 5 |
| Chem. 337 — Organic Chemistry Laboratory | 2 |
| Chem. 342 — Physical Chemistry | 3 |
| E.E. 202 — Direct and Alternating Current Circuits and Machines | 2 |
| E.E. 203 — Direct and Alternating Current Circuits and Machines Laboratory | 1 |
| Total | 17½ |

| | |
|---|---|
| Ch.E. 266 — Inspection Trip | ½ |
| Ch.E. 386 — Bioengineering | 5 |
| Ch.E. 381 — Plant Design | 3 |
| Chem. 344 — Principles of Chemical Thermodynamics | 2 |
| E.E. 204 — Application of Electrical Equipment | 2 |
| E.E. 205 — Electrical Equipment Laboratory | 1 |
| T.A.M. 221 — Resistance of Materials | 3 |
| T.A.M. 223 — Resistance of Materials Laboratory | 1 |
| Total | 17½ |

## Curriculum Preparatory to the Teaching of Chemistry

*For the Degree of Bachelor of Science in the Teaching of Chemistry*

This curriculum is for students preparing to teach physical science with a major in chemistry and with minors in physics and mathematics. The courses outlined below total 127 to 132 hours. A minimum of 125 hours of credit, not counting the first two years of work in military and physical education, is required for graduation.

If the student has not had adequate high school training in mathematics, he may be required to take Math. 106 or other elementary mathematics.

If the student has had no foreign language in high school or if he does not continue in the University the same language which he began in high school, it will be necessary for him to take two years of foreign language rather than the one year specified below.

### First Year

| First Semester | Hours |
|---|---|
| Rhet. 101 — Rhetoric and Composition | 3 |
| Chem. 101 or 102 — General Chemistry | 5 or 3 |
| Math. 117 — Combined Freshman Mathematics | 5 |
| Hygiene 101 — Health Lectures, or Elective | 2 |
| Physical Education | (1) |
| Military (men) | (1) |
| Electives | 2 |
| Total | 16 to 19 |

| Second Semester | Hours |
|---|---|
| Rhet. 102 — Rhetoric and Composition | 3 |
| Chem. 106 — Inorganic Chemistry | 5 |
| Math. 127 — Combined Freshman Mathematics | 4 |
| Ed. 101 — The Nature of the Teaching Profession | 2 |
| Hygiene 101 — Health Lectures, or Elective | 2 |
| Physical Education | (1) |
| Military (men) | (1) |
| Total | 17 or 18 |

### Second Year

| | |
|---|---|
| Chem. 110 — Qualitative Analysis | 5 |
| Foreign Language | 4 |
| Physics 101 or 103 — General Physics | 5 |
| Physical Education | (1) |
| Military (men) | (1) |
| Total | 15 or 16 |

| | |
|---|---|
| Chem. 124 — Quantitative Analysis | 5 |
| Foreign Language | 4 |
| Physics 102 or 104 — General Physics | 5 |
| Physical Education | (1) |
| Military (men) | (1) |
| Total | 15 or 16 |

### Third Year

| First Semester | Hours |
|---|---|
| Chem. 133 — Elementary Organic Chemistry, or Chem. 234 — Organic Chemistry | 5 |
| Math. 137 — Calculus | 3 |
| Physics | 3 |
| Psych. 100 — Introduction to Psychology | 4 |
| Speech 101 — Principles of Effective Speaking | 3 |
| Total | 18 |

| Second Semester | Hours |
|---|---|
| Chem. 240-241 — Elementary Physical Chemistry, or Chem. 350 — Biochemistry | 4 or 5 |
| Ed. 201 — Foundations of American Education | 2 |
| Ed. 240 — Principles of Secondary Education | 2 |
| Math. 147 — Calculus | 3 |
| Physics | 3 |
| Elective | 2 |
| Total | 16 or 17 |

### Fourth Year

*(Semesters are interchangeable.)*

| | |
|---|---|
| Hist. 152 — History of the United States, 1865-1951 | 3 |
| Math. 301 or 302 — Fundamental Concepts of Mathematics | 3 |
| Physics | 3 |
| Pol. Sci. 150 — American Government | 3 |
| Chemistry Elective | 2 |
| Other Electives | 2 |
| Total | 16 |

| | |
|---|---|
| Ed. 211 — Educational Psychology | 3 |
| Ed. 241 — Technic of Teaching in the Secondary School | 4 |
| Ed. 242 — Educational Practice in Secondary Education | 5 |
| Total | 12 |

### Fifth Year

*For the Degree of Master of Science in the Teaching of Chemistry*

| | Units |
|---|---|
| Chemistry | 4 |
| Electives | 2 |
| Ed. 311 — Psychology of Learning for Teachers | ½ |
| Ed. 312 — Mental Hygiene and the School | ½ |
| Two of the following courses: | |
| Ed. 301 — Philosophy of Education | ½ |
| Ed. 302 — History of American Education | ½ |
| Ed. 303 — Comparative Education | ½ |
| Ed. 304 — Social Foundations of Education | ½ |
| Total | 8 |

# UNDERGRADUATE COURSES OFFERED, 1950-1951

## Chemistry

### Inorganic Chemistry and Qualitative Analysis

**101. General Chemistry.** For students who have no entrance credit in high school chemistry. I, II; 5. Students who have used their high school chemistry for entrance credit receive only 3 hours credit. Students with 95 or more credit hours receive only 3 hours credit. Prerequisite: One unit of high school physics, or 2½ units of high school mathematics, or credit in Mathematics 111 or 112. **Bushey, Johnson, Tamres.**

**102. General Chemistry.** For students who have had one year of high school chemistry. I, II; 3. Students below the rank of senior receive 5 hours credit provided their high school chemistry has not been used for entrance credit and their final grade in Chemistry 102 is "C" or above. Students with 95 or more credit hours receive only 2 hours credit. Prerequisite: One unit of high school chemistry, or equivalent. **Bushey, Johnson, Tamres.**

**103. General Chemistry.** Lectures, recitations, and laboratory. For engineering students who have had no chemistry. I, II; 4. Students who have used their high school chemistry for entrance credit receive only 3 hours credit. Students with 95 or more credit hours receive only 3 hours credit. Prerequisite: One unit of high school physics, or 2½ units of high school mathematics, or credit in Mathematics 111 or 112. **Bushey, Johnson, Tamres.**

**104. Chemistry of the Metallic Elements.** Lectures, recitations, and laboratory. Limited to students in engineering curricula. I, II; 4. Credit will not be granted to students who have received credit in Chemistry 105 or 106. Students with 95 or more credit hours receive only 3 hours credit. Prerequisite: Chemistry 101, 102, or 103. **Tamres, Audrieth, Johnson.**

**105. Inorganic Chemistry and Qualitative Analysis.** Lectures, recitations, and laboratory. For students who are not eligible for Chemistry 104 or 106. I, II; 5. Credit in Chemistry 105 will not be granted to students who have received credit in Chemistry 104 or 106. Students with 95 or more credit hours receive only 3 hours credit. Prerequisite: Chemistry 101, 102, or 103. **Bailar, Bartow.**

**106. Inorganic Chemistry.** Metallic elements. For students in curricula of chemistry, and ceramic engineering, and chemistry majors who are not premedical students. I, II; 5. Credit will not be granted to students who have received credit in Chemistry 104 or 105. Students with 95 or more credit hours receive only 3 hours credit. Prerequisite: Chemistry 101, 102, or 103. **Martin.**

**107. General Chemistry and Qualitative Analysis.** Lectures, recitations, and laboratory. For students in curriculum of chemistry or chemical engineering. I; 5. Students with 95 or more credit hours receive only 3 hours credit. Prerequisite: Excellent high school background in chemistry as shown by a placement examination. **Moeller.**

**108. General Chemistry and Qualitative Analysis.** Lectures, recitations, and laboratory. For students in curriculum of chemistry or chemical engineering. II; 5. Students with 95 or more credit hours receive only 3 hours credit. Prerequisite: Chemistry 107. **Moeller.**

**110. Qualitative Analysis.** Qualitative analysis of metals and inorganic compounds. Open to all students; required of those whose major is chemistry or chemical engineering and those registered in the curriculum of chemistry except students who qualify for Chemistry 107 and 108. I, II; 5. Prerequisite: Chemistry 106. **Moeller.**

**196. General Chemistry.** Designed to give a cultural background with particular emphasis upon recent developments in the several fields of chemistry. (Chemistry 196-197 is an approved sequence in general education.) Lectures, recitations, and laboratory. I; 4. Prerequisite: Two units of high school mathematics. **Bushey.**

**197. General Chemistry.** Continuation of Chemistry 196. A student with a grade of "C" or better in Chemistry 197 may be admitted to Chemistry 104, 105, or 106. Credit for Chemistry 196, 197 and 104, 105, or 106 shall not exceed ten hours. II; 4. Prerequisite: Chemistry 196. **Bushey.**

### Quantitative Analysis

**122. Elementary Quantitative Analysis.** Gravimetric and volumetric analysis, stoichiometrical relations, practical applications. For all students in home economics and premedical courses and all others who have not followed the sequence Chemistry 101, 102 or 103, 106, and 110. I, II; 5. Prerequisite: Chemistry 104, 105, or 106. **Johnson.**

**123. Quantitative Analysis for Engineers.** A course in quantitative analysis designed for the needs of engineers, especially ceramic and metallurgical. I, II; 5. Prerequisite: Chemistry 104 or 105. **Johnson, Smith.**

**124. Quantitative Analysis.** Gravimetric and volumetric analysis, modern advanced theory and practice. For all students other than those specified for Chemistry 122 and 123. I, II; 5. Prerequisite: Chemistry 110, or satisfactory record in Chemistry 107 and 108. **Englis, Laitinen.**

### Organic Chemistry

**132. Elementary Organic Chemistry.** Beginning course in organic chemistry especially for students in the College of Agriculture. I, II; 3. Prerequisite: Chemistry 101 or 102, or equivalent. **Pelletier.**

**133. Elementary Organic Chemistry.** To fulfill the requirements for premedical, predental, preveterinary, dietetics, and home economics students. I, II; 5. Prerequisite: Chemistry 105 or 110. **Inskip.**

### COURSES FOR ADVANCED UNDERGRADUATES

### Organic Chemistry

**234. Organic Chemistry.** For students whose major is in chemistry, or for those registered in the curriculum of chemistry or chemical engineering. I, II; 5. Prerequisite: Chemistry 124. **Marvel.**

### Physical Chemistry

**240. Elementary Physical Chemistry.** Lectures and problems. I, II; 3. Prerequisite: Chemistry 124; Physics 103 and 104, or equivalent; Mathematics 132 or 137. **Gutowsky, Rodebush.**

**241. Elementary Physical Chemistry.** Laboratory to accompany Chemistry 240. I, II; 1. Prerequisite: Chemistry 124; Physics 101 and 102, or 103 and 104; Mathematics 132, or 137 and 147. **Gutowsky, Yankwich.**

**245. Elementary Physical Chemistry.** For students in engineering; not open to chemistry majors. I; 3. Prerequisite: Chemistry 122; Physics 101 and 102, or 103 and 104; Mathematics 132, or 137 and 147. **Yankwich.**

**246. Elementary Physical Chemistry.** For students in engineering; not open to chemistry majors. II; 3. Prerequisite: Chemistry 245. **Yankwich.**

**247. Elementary Physical Chemistry.** For premedical students only. I, II; 4. Prerequisite: Chemistry 122 and 133; Physics 102 or 104, or equivalent. **Ray.**

**249. Chemistry of Colloids.** Basic principles and applications. II; 3. Prerequisite: Chemistry 122 and 247, or equivalent. **Ray.**

### Miscellaneous

**290. Thesis.** Limited in general to seniors in the curriculum of chemistry. All students taking this course must present a thesis in order to receive credit. Except under unusual circumstances, only those students registered in Chemistry 290 will be recommended for honors. I, II; 2 to 6. Prerequisite: Majors in chemistry in the general curriculum may register if they have completed a minimum of twenty-three hours of chemistry, which must include at least five hours from courses for advanced undergraduates. Other students must have the consent of the head of the department. Each student who desires research must obtain, before the time of registration, special written permission from the instructor under whom he is to work. **Adams** (in charge).

**291. Elements of Glass Blowing.** Demonstrations and practice in the elementary operations of glass blowing. The construction of Pyrex laboratory equipment. I, II; 1. Prerequisite: Junior standing in chemistry. **Goodyear.**

**292. Chemical Literature and Reference Work.** Required of juniors in chemistry; advised for students in the curriculum of chemical engineering; with the consent of the instructor, elective for majors in chemistry. I, II; 1. Prerequisite: Eighteen hours of chemistry; one year of French or German; junior standing. **Bartow.**

**294. Chemical Literature and Reference Work.** For those who have had one semester of Chemistry 292. Required of juniors in chemistry; advised for students in the curriculum of chemical engineering. I, II; 1. Prerequisite: Chemistry 292. **Bartow.**

## COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

### Inorganic Chemistry

**315. Inorganic Chemistry.** Nuclear and extra-nuclear atomic structures and their relation to the properties of the elements and of their compounds; types of bonding; survey of the periodic relationships, preparation, and applications of the elements and their compounds. I, II; 3 hours, or ¾ unit. Prerequisite: Fifteen hours of credit in chemistry courses exclusive of courses numbered below 110. **Audrieth.**

**316. Inorganic Chemistry.** Preparation of typical inorganic compounds illustrating special and more advanced techniques. I, II; 2 hours, or ½ unit. Prerequisite: Credit or registration in Chemistry 315. **Martin, Moeller.**

### Analytical Chemistry

**324. Quantitative Inorganic Microanalysis and Chemical Statistics.** Lectures and discussions on modern micro and ultramicro apparatus, techniques, and applications; laboratory work on gravimetric and volumetric methods on the micro scale and on volumetric and photometric methods on the ultramicro scale; discussion of estimation and statistical treatment of errors; and applications of statistical methods to experimental design. II; 3 hours, or ¾ unit. Prerequisite: Chemistry 124 or Chemistry 325; senior or graduate standing in chemistry. **Clark, Johnson.**

**325. Analytical Chemistry.** A survey course. For advanced undergraduate and graduate students requiring further training and review in analytical chemistry. II; 3 hours, or ¾ unit. Prerequisite: Advanced standing in chemistry. **Laitinen.**

**326. Chemical Analysis and Treatment of Water.** Chemical and instrumental methods for analysis of water and determination of quality. Chemical principles and processes in water purification and conditioning. Relationship of chemistry of water to municipal and industrial use. I; 3 hours, or ¾ unit. Prerequisite: Chemistry 124. **Englis.**

**327. Special and Instrumental Methods of Analysis.** Gas analysis; electrometric titration, optical methods, and other advanced analyses. I, II; 3 hours, or ¾ unit. Prerequisite: Chemistry 124, 234, 240, and 241. **Smith.**

**328. Chemical Microscopy and Crystallography.** The theory and practice of the use of the optical microscope in chemical identification and analysis, and in the characterization and classification of crystals; principles of crystallization, crystal growth, polymorphism. I; 3 hours, or ¾ unit. Prerequisite: Chemistry 124 and 240; consent of instructor. **Clark, Johnson.**

**329. Food Analysis.** Quantitative organic analysis of food products; alcohols, carbohydrates, fats and oils, cereals, nitrogenous bodies, preservatives, and colors. II; 5 hours, or 1¼ units. Prerequisite: Chemistry 122 or 124, and 133 or 234. **Englis.**

### Organic Chemistry

**336. Organic Chemistry.** Second course. Lectures and recitations. I, II; 3 hours, or ¾ unit. Prerequisite: Chemistry 124 and 234. **Leonard, Marvel.**

**337. Organic Chemistry.** Laboratory experiments in organic chemistry. I, II; 2 hours, or ½ unit. Prerequisite: Chemistry 234 and 336. **Miller.**

**338. Systematic Identification of Organic Compounds.** I, II; 3 hours, or ¾ unit. Prerequisite: Chemistry 336 and 337, or equivalent. **Leonard, Snyder.**

### Physical Chemistry

**342. Elementary Physical Chemistry.** Continuation of Chemistry 240. Lectures. I, II; 3 hours, or ¾ unit. Prerequisite: Chemistry 240. **Gutowsky, Phipps.**

**343. Elementary Physical Chemistry.** Laboratory to accompany Chemistry 342. I, II; 1 hour, or ¼ unit. Prerequisite: Chemistry 240 and 241; credit or registration in Chemistry 342. **Gutowsky, Yankwich.**

**344. Principles of Chemical Thermodynamics.** Thermodynamics and free energy calculations. I, II; 2 hours, or ½ unit. Prerequisite: Chemistry 240 and 342, or consent of instructor. **Phipps, Rodebush.**

**345. Colloid and Surface Chemistry.** Physical chemistry for colloid systems; properties of surfaces and interfaces; applications. I; 3 hours, or ¾ unit. Prerequisite: Chemistry 336 and 342, or consent of instructor. **Ray.**

**346. Atomic Structure and Valence.** Advanced physical chemistry. I or II; 2 hours, or ½ unit. Prerequisite: Chemistry 240 and 342. **Yankwich.**

**349. Colloid and Surface Chemistry.** Laboratory. Quantitative experiments in colloid and surface chemistry. I, II; 1 hour, or ¼ unit. Prerequisite: Credit or registration in Chemistry 345, or consent of instructor. **Ray.**

### Biochemistry

**350. Biochemistry.** Chemistry of carbohydrates, lipids, and proteins; the alimentary processes, blood, tissues, and metabolism; quantitative analysis of gastric contents, blood, and urine. Clinical aspects for prospective students of medicine. Lectures, conferences, laboratory, and readings. I, II; 5 hours, or 1¼ units. Prerequisite: Chemistry 122 or 124, and 133 or 234. **Carter, Henderson, Rose, Vestling.**

**351. Techniques of Blood Analysis and Their Applications.** II; 3 hours, or ¾ unit. Prerequisite: Chemistry 350. **Carter.**

**352. Biochemistry of Vitamins and Hormones.** II; 3 hours, or ¾ unit. Prerequisite: Chemistry 350. **Carter.**

### Miscellaneous

**395. History of Science with Particular Reference to Chemistry.** I; 2 hours, or ¼ unit. Prerequisite: Junior standing with twenty hours of laboratory science. **Bartow.**

**397. Radiochemistry.** Properties of radioactive nuclei, nature of radioactivity, nuclear reactions, detection equipment, and tracer technique. Lectures. I, II; 2 hours, or ½ unit. Prerequisite: Chemistry 240 and 241. **Duffield.**

**398. Radiochemistry.** Laboratory to accompany Chemistry 397. I, II; 1 hour, or ¼ unit. Prerequisite: Chemistry 240 and 241; credit or registration in Chemistry 397; consent of instructor. **Duffield.**

## Chemical Engineering

### COURSES FOR ADVANCED UNDERGRADUATES

**261. Stoichiometry.** A course of lectures and problems on material balances and heat balances combined with an introduction to chemical engineering. I; 3. Prerequisite: Credit or registration in Chemistry 240, or 245 and 246. **Baron.**

**266. Inspection Trip.** Inspection of the manufacturing facilities of several chemical and fabrication plants. Duration of trip: three days each semester. I, II; ½. Prerequisite: Senior standing in chemistry or chemical engineering; consent of instructor. **Westwater.**

**267. Measurements and Instrumentation.** Methods and instruments used for the control of industrial chemical processes. Conferences, laboratory, and readings. I; 2. Prerequisite: Junior standing; Physics 101 and 102, or 103 and 104. **Westwater.**

**290. Thesis.** Limited in general to seniors in the curriculum in chemical engineering. Others must have the consent of the head of the department. All students taking this course must present a thesis in order to receive credit. I, II; 2 to 6. **Adams** (in charge).

### COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

**363. Unit Operations in Food Technology.** Same as Food Technology 363. Fundamentals of heat transfer, fluid flow, extraction, drying, and other unit operations especially adapted to the food and biochemical industries. Primarily for students in chemistry and food technology; not open to majors in chemical engineering. Lectures and problems. I; 3 hours, or ¾ unit. Prerequisite: Chemistry 240 or Chemistry 247 and one year of calculus. **Finn.**

**370. Chemical Engineering Thermodynamics.** The fundamental concepts and laws of thermodynamics. Primarily for students in chemical engineering. I, II; 3 hours, or ½ unit. Prerequisite: Chemical Engineering 261; Chemistry 240. **Comings, Drickamer.**

**371. Principles of Chemical Engineering.** Scientific principles in unit operations of chemical engineering. Lectures, problems, and quizzes. II; 4 hours, or 1 unit. Prerequisite: Chemical Engineering 370, or consent of instructor. **Baron.**

**372. Unit Operations Laboratory.** First course. To accompany Chemical Engineering 371. I, II; 2 hours, or ¼ unit. Prerequisite: Credit or registration in Chemical Engineering 371. **Westwater.**

**373. Principles of Chemical Engineering.** Scientific principles in unit operations of chemical engineering. Lectures, problems, and quizzes. I; 4 hours, or 1 unit. Prerequisite: Chemical Engineering 371; Chemistry 240. **Drickamer.**

**374. Unit Operations Laboratory.** Second course. To accompany Chemical Engineering 373. I, II; 2 hours, or ¼ unit. Prerequisite: Credit or registration in Chemical Engineering 373. **Baron, Campbell, Westwater.**

**377. Chemical Engineering Technology.** Study of in-

dustrial chemical processes and principles. I; 3 hours, or ½ unit. Prerequisite: Chemistry 240. **Westwater.**

**379. Chemical Engineering Projects.** Laboratory. Development of an individual project. I, II; 2 hours, or ½ unit. Prerequisite: Senior standing in chemistry or chemical engineering. **Johnstone.**

**380. Chemical Engineering Calculations.** Numerical and graphical methods for problems in equilibria and kinetics. Lectures and recitations. II; 3 hours, or ¾ unit. Prerequisite: Chemistry 344; Chemical Engineering 371. **Baron.**

**381. Chemical Engineering Plant Design.** Comprehensive problems. I, II; 3 hours, or ½ unit. Prerequisite: Chemical Engineering 373. **Finn.**

**382. High Pressure Reactions.** Lectures, recitations, and problems. II; 2 hours, or ½ unit. Prerequisite: Chemistry 234 and 344. **Comings.**

**383. Applied Electrochemistry.** Use of electric current through solutions for carrying out reactions. Lectures. I; 2 hours, or ½ unit. Prerequisite: Chemistry 234, 336, and 342. **Swann.**

**384. Power Plant and Boiler Water Problems.** I; 2 hours, or ½ unit. Prerequisite: Senior standing in chemical engineering. **Straub.**

**385. Bioengineering.** Study of the chemical processes and principles used in the production of foodstuffs, pharmaceuticals, and fine chemicals. Primarily for students in chemical engineering. May be substituted for Chemical Engineering 377 and 374 in the chemical engineering curriculum. Lectures and laboratory. Laboratory may be omitted by graduate students. I; 5 hours, or 1 to 1¼ units. Prerequisite: Credit or registration in Chemical Engineering 373. **Finn.**

**386. Bioengineering.** Principles of chemical engineering applied to the fermentation and allied industries. May be used as an advanced elective and as a substitute for Chemical Engineering 379 in the chemical engineering curriculum. Lectures and laboratory. II; 5 hours, or 1 to 1¼ units. Prerequisite: Bacteriology 320, Chemistry 234 and 240, or consent of instructor. **Finn.**

**387. Flow of Fluids.** Advanced course. Lectures, recitations, and problems. I; 2 hours, or ¾ unit. Prerequisite: Chemical Engineering 371, or equivalent with consent of instructor. **Comings.**

**388. Heat Transmission.** Advanced course. Lectures, recitations, and problems. I; 2 hours, or ¾ unit. Prerequisite: Chemical Engineering 371, or equivalent with consent of instructor. **Comings.**

# GRADUATE WORK OFFERED, 1950-1951[1]

The degrees offered in chemistry and chemical engineering are Master of Arts or Master of Science in Chemistry, Master of Science in Chemical Engineering and Doctor of Philosophy in Chemistry or Chemical Engineering.

Candidates for an advanced degree in chemistry or chemical engineering must have had the equivalent of twenty-five semester hours in chemistry, properly distributed. Students who have fulfilled the undergraduate course requirements may apply for entrance to the Graduate College in chemistry or chemical engineering if they have a grade-point average of 4.0 for that portion of undergraduate work representing the last fifty per cent of the hours completed to secure the bachelor's degree, exclusive of hygiene, military, and physical education courses. Students on limited status will not be admitted. (Formerly a 3.75 average for all undergraduate work was required.)

A reading knowledge of German and French or Russian is recommended for all graduate students in chemistry and chemical engineering.

Students who have obtained graduate credit in some other university may apply for admission provided, (1) their undergraduate records meet the above requirements, and (2) their grade-point averages in graduate work are at least 4.0. If a student's undergraduate record has not met the requirements specified above, the average in graduate work must be at least 4.25 in order to be admitted to the Graduate College in chemistry at the University of Illinois.

All students who receive permits to enter the Graduate College in chemistry or chemical engineering, regardless of whether they have had training beyond the bachelor's degree, must take registration examinations. These are offered in the week prior to the opening of the first semester for those entering in the summer or in the fall, and in the week prior to the opening of the second semester for those entering in February. Those who intend to major in any field of chemistry must take four examinations covering the normal undergraduate instruction in inorganic, analytical, organic, and physical chemistry; those who intend to specialize in chemical engineering must take two of the examinations in chemistry, one of which must be physical chemistry and the other of the student's own selection; and, in addition, two in chemical engineering covering the usual undergraduate instruction in that subject. The results of these registration examinations are not permanently recorded but serve merely to assist in the registration of students in the proper graduate courses. Students who demonstrate through these examinations that they are deficient will be required to register in one or more specific courses before taking more advanced work in a particular field. Most of these courses allow graduate residence credit.

Candidates for the Master of Arts or Master of Science degree with a major in chemistry must include among their courses Chemistry 240 and 241, or equivalent.

Candidates for the Doctor of Philosophy degree in any branch of chemistry must include among their courses Chemistry 240, 241, 342, and 343, or equivalent.

The Graduate College offers fellowships to worthy students including those who intend to specialize in chemistry or chemical engineering. Applications should be sent to the Dean of the Graduate College. In addition, the chemistry department has industrial or institutional fellowships and research assistantships for chemistry and chemical engineering students which vary in number from year to year. These appointments are awarded upon application, more often to those students who have already been at the University of Illinois for two semesters and who have demonstrated their ability in the Graduate College. The department also has several postdoctoral research assistantships available. Applications for research assistantships should be sent directly to the chemistry department.

Teaching assistantships in chemistry and chemical engineering are numerous. These are open to all students who are entering for graduate study. Applications for teaching appointments should be made directly to the chemistry department.

[1] Advanced training in the teaching of chemistry is described on page 36.

## Chemistry[1]

### Inorganic Chemistry

**402. Inorganic Chemistry.** The less familiar elements and their relationship in the periodic system. Lectures, reports, and assigned readings. II; ¾ unit. **Moeller.**

**404. Inorganic Chemistry.** Advanced laboratory. Inorganic preparations and qualitative analysis involving the less familiar elements. II; ¼ to ¾ unit. Prerequisite: Credit or registration in Chemistry 402. **Audrieth.**

**405. Inorganic Chemistry.** Seminar. Required of all graduate students whose major is inorganic chemistry. I, II; ¼ unit. **Audrieth.**

**406. Special Topics in Inorganic Chemistry.** Discussions and reports. I, II; ¾ unit. **Audrieth, Bailar, Martin.**

### Analytical Chemistry

**421. Optical Methods of Chemical Analysis.** I; ¾ unit. Prerequisite: General physics and chemistry equivalent to a major for a bachelor's degree. **Englis.**

**422. Electrical Methods of Chemical Analysis.** Lectures and laboratory. Polarography, potentiometric, amperometric, conductometric titrations, dielectric methods, etc. II; ¾ unit. **Laitinen.**

**423. Qualitative Microanalysis.** Lectures and laboratory. Micro-techniques, spot tests, and organic reagents. I;

[1] Graduate work also may be arranged in undergraduate courses of the 300 level.

¾ unit. Prerequisite: Chemistry 110 and 124, or equivalent. **Laitinen.**

**424. Quantitative Analysis.** Advanced principles, calculations, experimental methods, and applications. Required of all graduate students whose major or minor is analytical chemistry. II; ½ unit. **Smith.**

**425. Analytical Chemistry.** Seminar. Special topics in analytical chemistry. Required of all graduate students whose major or minor is analytical chemistry. I, II; ¼ to 1 unit. Prerequisite: Students must be taking major or first minor for the degree of Doctor of Philosophy in analytical division. **Clark.**

**426. Applied X-rays.** Lectures. I; ½ unit. Prerequisite: Training in physics and physical chemistry. **Clark.**

**427. Applied X-rays.** Lectures. II; ½ unit. Prerequisite: Training in physics and physical chemistry. **Clark.**

**428. Applied X-rays.** Laboratory. Optional laboratory work to accompany lectures in Chemistry 426 and 427. Training in operation of all types of X-ray apparatus with special emphasis on diffraction; experimental chemical identification and crystal structure analyses from powder and single crystal patterns. I; ½ unit. Prerequisite: Chemistry 426 or 427; training in physics, mathematics, and physical chemistry. **Clark.**

**429. Applied X-rays.** Laboratory. Optional laboratory work to accompany lectures in Chemistry 426 and 427. Training in operation of all types of X-ray apparatus with special emphasis on diffraction; experimental chemical identification and crystal structure analyses from powder and single crystal patterns. II; ½ unit. Prerequisite: Chemistry 426 or 427; training in physics, mathematics, and physical chemistry. **Clark.**

### Organic Chemistry

**430. Organic Chemistry.** Survey of organic chemistry designed for first-year graduate students. I, II; 1 unit. Prerequisite: One year (ten hours) of organic chemistry. **Fuson.**

**432. Organic Chemistry.** Advanced survey of organic chemistry (to follow Chemistry 430). II; 1 unit. Prerequisite: Chemistry 430, or equivalent. **Snyder.**

**433. Organic Chemistry.** Optical isomerism, *cis-trans* isomerism, tautomerism, chemistry of the carbohydrates, etc. I; ¾ unit. Prerequisite: Chemistry 430 and 432, or consent of instructor. **Leonard.**

**434. Advanced Organic Synthesis.** I, II; ½ to 1 unit. **Alexander, Miller.**

**435. Organic Chemistry.** Seminar. Current literature in organic chemistry. I, II; ½ unit. Prerequisite: Consent of instructor. In most cases, students must be doing research in organic chemistry and be registered for the degree of Doctor of Philosophy. **Adams.**

**436. Organic Chemistry.** Quantitative organic analysis and newer methods in organic laboratory procedure. A laboratory course designed to acquaint students with newer research techniques. I, II; ½ to 1 unit.

### Physical Chemistry

**440. Physical Chemistry.** Survey of physical chemistry for graduate students. I, II; ¾ to 1 unit. Prerequisite: Chemistry 240 and 342, or equivalent. **Phipps, Wall.**

**441. Chemical Thermodynamics.** Fundamental laws of thermodynamics and calculation of thermodynamic quantities. I; 1 unit. Prerequisite: Elementary physical chemistry. **Wall.**

**442. Chemical Thermodynamics.** Fundamental laws of thermodynamics and calculation of thermodynamic quantities. II; 1 unit. Prerequisite: Elementary physical chemistry. **Wall.**

**443. Molecular Structure.** The structure of molecules and relationships to physical properties. II; 1 unit. Prerequisite: Chemistry 342. **Yankwich.**

**444. Physical Chemistry.** Kinetic theory in statistical mechanics. I or II; ¾ unit. Prerequisite: Chemistry 441 and 442. Offered in 1950-1951 and in alternate years, alternating with Chemistry 446. **Phipps.**

**445. Physical Chemistry.** Seminar. I, II; ½ to ¾ unit. Prerequisite: Chemistry 240, 342, 441, and 442. **Rodebush.**

**446. Quantum Chemistry I.** Introduction to quantum mechanics and its application to chemical problems. Lectures. I; ¾ unit. Prerequisite: Chemistry 443; consent of instructor. Offered in 1951-1952 and in alternate years, alternating with Chemistry 444. **Gutowsky.**

**447. Quantum Chemistry II.** A continuation of Chemistry 446; primarily the application of quantum theory of molecular structure and molecular spectra. Lectures. II; ¾ unit. Prerequisite: Chemistry 443, or equivalent; Chemistry 446. Offered in 1951-1952 and in alternate years, alternating with Chemistry 448. **Gutowsky.**

**448. Chemical Kinetics.** Chemical reaction and the theory of rate processes. Lectures. II; ¾ unit. Prerequisite: Chemistry 444, or equivalent; consent of instructor. Offered in 1950-1951 and in alternate years, alternating with Chemistry 447. **Gutowsky.**

### Biochemistry

**450. Biochemistry.** Lectures and readings. Chemistry of intermediary metabolism. II; ¾ unit. Prerequisite: Chemistry 350, or equivalent. **Rose.**

**452. Biochemistry.** Chiefly laboratory. Difficult biochemical preparation; analytical methods. I, II; ½ to 1 unit. Prerequisite: Chemistry 350, or equivalent. **Rose.**

**455. Biochemistry.** Seminar. Current literature. Required of all graduate students whose major is biochemistry. I, II; ¾ unit. Prerequisite: Chemistry 350, or equivalent. **Rose.**

### Sanitary Chemistry

**485. Chemistry of Water Treatment.** Seminar. Special problems and new developments in sanitary chemistry. I, II; ¼ to 1¼ units. Prerequisite: Graduate standing in science or engineering. **Buswell.**

### Miscellaneous

**490. Research.** Candidates for the Master of Arts or Master of Science degree who elect research are required to present a thesis. A thesis is always required of all students working toward the degree of Doctor of Philosophy.

Not all candidates for thesis work necessarily will be accepted. Students whose major is in departments other than chemistry must receive permission from the head of the chemistry department to register in this course. I, II; ¼ to 4 units. Work may be taken in the following fields, subject to the approval of one of the qualified staff members:

**Analytical Chemistry. Clark, Englis, Laitinen, Smith.**
**Applied X-rays and Electron Microscopy. Clark.**
**Biochemistry. Carter, Henderson, Rose, Vestling.**
**Ceramic Chemistry. Andrews.**
**Food Chemistry; Phytochemistry. Englis.**
**Inorganic Chemistry. Audrieth, Bailar, Laitinen, Martin, Moeller.**
**Organic Chemistry. Adams, Alexander, Fuson, Leonard, Marvel, Miller, Snyder.**
**Physical Chemistry. Gutowsky, Phipps, Ray, Rodebush, Wall, Yankwich.**
**Polarography and Related Topics. Laitinen.**
**Water Chemistry; Zymochemistry. Buswell.**

**492. Chemical Literature and Reference Work.** I; ¼ unit. **Bartow.**

## Chemical Engineering[1]

The department of chemistry offers graduate work leading to the degrees of Master of Science and Doctor of Philosophy in Chemical Engineering. Candidates for these degrees should have had undergraduate training comparable to that offered at the University of Illinois, including mathematics through calculus, year courses in physics, mechanics, and electrical engineering, and the equivalent of twenty-five hours in chemistry, including organic and physical chemistry. Students who enter without the usual engineering courses prescribed in the undergraduate chemical engineering curriculum will be required to make up their deficiencies to the extent prescribed by their adviser.

Candidates for the Master of Science degree in Chemical Engineering must include Chemical Engineering 387 and 388 among their courses.

**463. Evaporation, Drying, Humidification, and Dehumidification.** Lectures. I; ¾ unit. Prerequisite: Chemical Engineering 373. Offered in 1951-1952 and in alternate years. **Johnstone.**

**464. Absorption and Extraction.** Lectures. I; ¾ unit. Prerequisite: Chemical Engineering 373. Offered in 1950-1951 and in alternate years. **Johnstone.**

**465. Chemical Engineering.** Seminar. Required of all graduate students whose major is chemical engineering. I, II; ¼ unit. Prerequisite: Chemical Engineering 373. **Johnstone.**

**466. Filtration and Separations.** Properties of particulate matter: aerosols, suspensions, slurries, and packed beds; methods of comminution and separation. Lectures and problems. II; ¾ unit. Prerequisite: Chemical Engineering 373. Offered in 1950-1951 and in alternate years. **Johnstone.**

**467. Distillation.** Application of principles of distillation to binary and multicomponent mixtures including a discussion of azeotropic and extractive distillation. II; ¾ unit. Prerequisite: Chemical Engineering 373. Offered in 1951-1952 and in alternate years. **Drickamer.**

**468. Advanced Plant Design.** Problems in equipment design and plant layout. Lectures and conferences. II; ¾ unit. Prerequisite: Chemical Engineering 373, 387, and 388. Offered in 1951-1952 and in alternate years. **Johnstone.**

**469. Industrial Reaction Kinetics and Catalysis.** The prediction of physical properties and absolute reaction rates from theory. The application of these to the design of industrial reactors. II; 1 unit. Prerequisite: Graduate standing in chemical engineering; consent of instructor. Offered in 1950-1951 and in alternate years. **Drickamer.**

**490. Research.** Candidates for the master's degree who elect research are required to write a thesis. A thesis is always required for the degree of Doctor of Philosophy. Not all candidates for thesis work necessarily will be accepted. Any student whose major is in another department must receive permission from the head of the department to register in this course. I, II; ¼ to 4 units. **Baron, Comings, Drickamer, Johnstone, Straub, Swann, Westwater.**

[1] Graduate work also may be arranged in undergraduate courses of the 300 level.

# SCIENTIFIC PUBLICATIONS

## Editorial Contributions

**Adams, Roger,** Editor-in-Chief, "Organic Reactions" 1941–; Editorial Board of Gilman's, "Organic Chemistry, Advanced Treatise," Ed. 2; Editorial Advisory Board, "Organic Syntheses," 1933–.

**Audrieth, L. F.,** Editorial Board, "Inorganic Syntheses," Vol. I and Vol. II, Editor-in-Chief, Vol. III; National Editor, Phi Lambda Upsilon Register, 1939-42.

**Bailar, J. C., Jr.,** Board of Publication, Journal of Chemical Education, 1942-47; Editorial Board, Journal of the American Chemical Society, 1950–; Assistant Editor, "Inorganic Syntheses," Vols. I, II, and III, Editor-in-Chief, Vol. IV.

**Carter, H. E.,** Editor-in-Chief, "Biochemical Preparations," Vol. I; Editorial Board, Journal of Biological Chemistry, 1950-55; Editor, Chemical Reviews, 1950-53.

**Clark, G. L.,** Associate Editor, Journal of Radiology, 1929–; Associate Editor, Biodynamica, 1939–.

**Fuson, R. C.,** Editorial Board, Journal of the American Chemical Society, 1932-42; Editorial Advisory Board, "Organic Syntheses," 1939–.

**Johnstone, H. F.,** Editorial Board, Chemical Reviews, 1946-49; Advisory Board, Industrial and Engineering Chemistry, 1949–; Advisory Board, Chemical Engineering News, 1949–.

**Laitinen, H. A.,** Advisory Board, Analytical Chemistry, 1949–.

**Leonard, N. J.,** Executive Committee, member ex-officio, Journal of Organic Chemistry, 1950–; Editorial Board, "Organic Syntheses," 1950–.

**Marvel, C. S.,** Editorial Board, Journal of the American Chemical Society, 1943–; Board of Editors, Journal of Organic Chemistry, 1936–; Editorial Advisory Board "Organic Syntheses," 1933–; Editorial Board, Proceedings National Academy of Sciences, 1950–; Editorial Board of Gilman's "Organic Chemistry, Advanced Treatise," Ed. 2.

**Moeller, G. T.,** Editorial Board, "Inorganic Syntheses," 1950–.

**Rodebush, W. H.,** Associate Editor, Journal of Physical Chemistry, 1941-42.

**Rose, W. C.,** Editorial Board, Journal of Biological Chemistry, 1936-49.

**Shriner, R. L.,** Board of Editors, Journal of Organic Chemistry, 1936-42; Editorial Board, "Organic Syntheses," 1939–.

**Snyder, H. R.,** Editor-in-Chief, "Organic Syntheses," Vol. 28; Editorial Board, "Organic Syntheses," 1942-50; Advisory Board "Organic Syntheses," 1950–; Editorial Board, "Organic Reactions," 1942-50.

**Swann, Sherlock, Jr.,** Divisional Editor, Journal of the Electrochemical Society, Publication Committee, Review Staff, 1949. Divisional Editor 1950–.

## Books

**Adams, Roger** and **Johnson, J. R.,** "Laboratory Experiments in Organic Chemistry," The Macmillan Company, New York, 1949, Ed. 4.

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## Summary of Publications by Five-year Periods

| Years | Number of Papers | Senior Faculty (Average Number) | Papers per Member | Years | Number of Papers | Senior Faculty (Average Number) | Papers per Member |
|---|---|---|---|---|---|---|---|
| 1870-1875 | 4 | 1 | 4.0 | 1911-1915 | 161 | 17 | 9.5 |
| 1876-1880 | 8 | 1 | 8.0 | 1916-1920 | 196 | 21 | 9.5 |
| 1881-1885 | 2 | 1 | 2.0 | 1921-1925 | 260 | 26 | 10.0 |
| 1886-1890 | 1 | 1 | 1.0 | 1926-1930 | 420 | 28 | 15.0 |
| 1891-1895 | 3 | 2 | 1.5 | 1931-1935 | 480 | 27 | 17.7 |
| 1896-1900 | 9 | 4 | 2.25 | 1936-1940 | 479 | 32 | 14.9 |
| 1901-1905 | 26 | 9 | 2.88 | 1941-1945 | 424 | 33 | 12.8 |
| 1906-1910 | 159 | 13 | 12.2 | 1946-1950 | 608 | 42 | 14.4 |

# Publications, 1941-1950

The following is a list of publications by members of the department of chemistry from January 1, 1941, to January 1, 1951. For the list of publications from the time of the department's organization to January 1, 1941, see Appendix.

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# DOCTOR OF PHILOSOPHY DEGREES

## Listing by Classes

### CLASS OF 1903

**Dehn, William Maurice,** Deceased.

### CLASS OF 1906

**Scovell, Melville Amasa,** Deceased.

**Trowbridge, Perry Fox,** Deceased.

### CLASS OF 1907

**East, Edward Murray,** Deceased.

### CLASS OF 1910

**Derick, Clarence George,** Box 666, Sewaren, New Jersey.

**Ernest, Thomas Reuben,** 45th Place and Packers Avenue, Union Stock Yards, Chicago, Illinois.

**Homberger, Alfred William,** School of Medicine, University of Louisville, Louisville 2, Kentucky.

**Howe, Paul Edward,** Bureau of Animal Industry, United States Department of Agriculture, Beltsville, Maryland.

**Kostalek, John Anton,** Deceased.

**Mattill, Henry Albright,** Department of Biochemistry, State University of Iowa, Iowa City, Iowa.

### CLASS OF 1911

**Burke, Charles Eldrid,** Deceased.

**MacInnes, Duncan Arthur,** Rockefeller Institute for Medical Research, New York 21, New York.

### CLASS OF 1912

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**Strachan, Earle Kenneth,** Deceased.

### CLASS OF 1913

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### CLASS OF 1914

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**Knight, Henry Granger,** Deceased.

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**Skinner, Glenn Seymour,** Department of Chemistry, University of Delaware, Newark, Delaware.

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## CLASS OF 1918

**Braham, Joseph Marvin,** 4675 Via Huerto, Santa Barbara, California.

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**Hicks, John Frederick Gross,** Deceased.

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**Winkelmann, Herbert August,** Dryden Rubber Division, Sheller Manufacturing Company, Chicago, Illinois

## CLASS OF 1920

**Austin, Miner Manly,** Deceased.

**French, Herbert Ephraim,** Deceased.

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## CLASS OF 1921

**Bradley, Manson James,** Deceased.

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**Taylor, John Bradshaw,** Deceased.

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## CLASS OF 1928

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**Coons, Charles Curtis,** Hoover Company, North Canton, Ohio.

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**Hyde, James Franklin,** Corning Glass Works, Corning, New York.

**Leslie, Robert Thies,** National Bureau of Standards, Washington 25, D. C.

**Martin, Lawrence Forstall,** Southern Regional Laboratory, United States Department of Agriculture, New Orleans, Louisiana.

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## CLASS OF 1929

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## CLASS OF 1930

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## CLASS OF 1931

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**Smith, Harold Agnew,** Deceased.

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## CLASS OF 1932

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## CLASS OF 1934

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## CLASS OF 1935

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**Cooke, Thomas Gaunt,** Deceased.

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**Reynolds, Dexter Harold,** Perlatex Corporation, Albuquerque, New Mexico.

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## CLASS OF 1937

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## CLASS OF 1941

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**McPherson, James Beverly, Jr.,** Standard Oil Development Company, Research Division, Linden, New Jersey.

**Marvell, Elliot Nelson,** Department of Chemistry, Oregon State College, Corvallis, Oregon.

**Matheson, Arthur Ralph,** Research Services Division, Schenectady Operations Office, United States Atomic Energy Commission, Schenectady, New York.

**Moore, Allen Charlton,** Parke, Davis and Company, Detroit 32, Michigan.

**Munn, George Edward,** Polychemicals Department, Experimental Station, E. I. duPont de Nemours and Company, Wilmington, Delaware.

**Nathan, Marvin Freeman,** M. W. Kellogg Company, 225 Broadway, New York 7, New York.

**Nielson, Eldon Denzel,** The Upjohn Company, Kalamazoo, Michigan.

**Nyman, Carl John, Jr.,** Department of Chemistry, State College of Washington, Pullman, Washington.

**Pilgrim, Frederick John,** Charles Pfizer and Company, Incorporated, Groton, Connecticut.

**Rao, Nutulapaty Shanmukha,** Central Laboratory for Scientific and Industrial Research, Hyderabad (Deccan), India.

**Schrecker, Anthony Wolfgang,** National Cancer Institute, Bethesda 14, Maryland.

**Schweitzer, George Keene,** Department of Chemistry, University of Tennessee, Knoxville, Tennessee.

**Shotwell, Odette Louise,** Northern Regional Research Laboratory, Peoria, Illinois.

**Sollo, Frank Vincent, Jr.,** National Aluminate Corporation, Chicago 38, Illinois.

**Speziale, Angelo John,** Monsanto Chemical Company, St. Louis 4, Missouri.

**Stent, Gunther Siegmund,** Universitetets Institut for Cytofysiologi, Juliane Maries Veu 28, Copenhagen, Denmark.

**Van Abeele, Frederick Richard,** Eli Lilly and Company, Indianapolis 6, Indiana.

**Williams, Jack Leland Redavat,** Eastman Kodak Company, Rochester 4, New York.

**Williams, Jesse Noah, Jr.,** Department of Biochemistry, University of Wisconsin, Madison, Wisconsin.

## CLASS OF 1949

**Aldrich, Paul Harwood,** Hercules Powder Company, Wilmington, Delaware.

**Anderson, Hugh Verity,** The Upjohn Company, Kalamazoo, Michigan.

**Arvan, Peter George,** Phosphate Division, Monsanto Chemical Company, Dayton, Ohio.

**Barthel, Eric, Jr.,** Organic Chemicals Department, Jackson Laboratory, E. I. duPont de Nemours and Company, P. O. Box 525, Wilmington, Delaware.

**Berry, Robert Edward,** Texas Oil Company, Beacon, New York.

**Beyler, Roger Eldon,** Merck and Company, Incorporated, Rahway, New Jersey.

**Bhattacharyya, Prabhat Kumar,** Department of Chemistry, University of Illinois, Urbana, Illinois.

**Block, Burton Peter,** Department of Chemistry, Pennsylvania State College, State College, Pennsylvania.

**Bluestein, Bernard Richard,** Department of Chemistry, Purdue University, Lafayette, Indiana.

**Bockstahler, Theodore Edwin,** Rohm and Haas Company, Philadelphia 37, Pennsylvania.

**Boyer, Joseph Henry,** Department of Chemistry, University of Michigan, Ann Arbor, Michigan.

**Brandt, Warren William,** Department of Chemistry, Purdue University, West Lafayette, Indiana.

**Brantley, John Calvin,** Linde Air Products Company, Tonawanda, New York.

**Brown, Jerome Engel,** Ethyl Corporation, 1600 West Eight Mile Road, Ferndale, Detroit 20, Michigan.

**Burdett, Lorenzo Worth,** Standard Oil Company (Indiana), Whiting, Indiana.

**Burk, Emmett H., Jr.,** Sherwin-Williams Company, Chicago 28, Illinois.

**Campbell, John B.,** Organic Chemicals Department, Jackson Laboratories, E. I. duPont de Nemours and Company, P. O. Box 525, Wilmington, Delaware.

**Cataldi, Horace Anthony,** Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

**Cohen, Alvin Jerome,** Naval Ordnance Test Station, Inyokern, California.

**Delbecq, Charles Jarchow,** Argonne National Laboratory, Chicago 80, Illinois.

**Douglas, Bodie Eugene,** Department of Chemistry, Pennsylvania State College, State College, Pennsylvania.

**Elins, Herbert Samuel,** Eastman Kodak Company, Rochester 4, New York.

**Felley, Donald Louis,** Rohm and Haas Company, Philadelphia 5, Pennsylvania.

**Flynn, Edwin Harold,** Eli Lilly and Company, Indianapolis 6, Indiana.

**Gilkey, Russell,** Tennessee Eastman Corporation, Kingsport, Tennessee.

**Gordon, Joseph Rudnick,** Johnson and Johnson, New Brunswick, New Jersey.

**Guerrant, Gordon Owen,** Shell Oil Company, 3737 Bellaire Boulevard, Houston 5, Texas.

**Hagan, Sister Mary Martinette,** Mundelein College, Chicago 40, Illinois.

**Hall, Henry Kingston, Jr.,** Department of Chemistry, University of California at Los Angeles, Los Angeles, California.

**Hamlin, William Earl,** Upjohn Company, Kalamazoo, Michigan.

**Heckert, Richard Edwin,** Chemical Department, Experimental Station, E. I. duPont de Nemours and Company, Wilmington, Delaware.

**Huizenga, John Robert,** Argonne National Laboratory, Chicago 80, Illinois.

**Humiston, Charles George,** Dow Chemical Company, Midland, Michigan.

**Hwa, Jesse Chia-Hsi,** Rohm and Haas Company, Philadelphia 37, Pennsylvania.

**Hyson, Archibald Miller,** Polychemicals Department, Experimental Station, E. I. duPont de Nemours and Company, Wilmington, Delaware.

**Inskeep, Richard Guy,** Department of Chemistry, Brown University, Providence, Rhode Island.

**Jackson, Harold Leonard,** Chemical Department, Experimental Station, E. I. duPont de Nemours and Company, Wilmington, Delaware.

**Johnson, James Leslie,** The Upjohn Company, Kalamazoo, Michigan.

**Johnson, John Harpster,** Monsanto Chemical Company, Dayton, Ohio.

**Jones, Viron Vernon,** Henry Ford Hospital, Detroit, Michigan.

**Keplinger, Orin Clawson, Jr.,** General Tire and Rubber Company, Akron 9, Ohio.

**Kimpton, Dudley Davis,** Anderson Physical Laboratory, Champaign, Illinois.

**King, Glendall Lee,** School of Medicine, Washington University, St. Louis, Missouri.

**Koehneke, John Henry,** The Upjohn Company, Kalamazoo, Michigan.

**Krigbaum, William Richard,** Department of Chemistry, Cornell University, Ithaca, New York.

**Lenoir, John Milton,** Department of Chemical Engineering, University of Arkansas, Fayetteville, Arkansas.

**Leubner, Gerhard Walter,** Eastman Kodak Company, Rochester 4, New York.

**Libby, William Harris,** General Aniline and Film Corporation, Easton, Pennsylvania.

**Light, Rupert Edwin, Jr.,** Buffalo Electrochemical Company, Station B, Buffalo, New York.

**Marshall, Clifford Daniel,** Shell Chemical Company, Houston, Texas.

**Mirza, John,** Sumner Chemical Company, Incorporated, Elkhart, Indiana.

**Mudrak, Anton,** Harshaw Chemical Company, 1945 East 97th Street, Cleveland 6, Ohio.

**Mueller, Melvin Henry,** Argonne National Laboratory, Chicago 80, Illinois.

**Nelson, Nils Keith,** Shell Oil Company, Wood River, Illinois.

**Nommensen, Erwin Ward,** Esso Standard Oil Company, Louisiana Division, Baton Rouge, Louisiana.

**Painter, Charles LaVerne,** Procter and Gamble Company, Cincinnati 17, Ohio.

**Pellegrini, John Peter, Jr.,** Gulf Research and Development Company, Pittsburgh, Pennsylvania.

**Phillips, Robert Richard,** Eastman Kodak Company, Rochester 4, New York.

**Pierce, Norwin Caley,** Rayon Department, Nylon Research Section, Experimental Station, E. I. duPont de Nemours and Company, Wilmington, Delaware.

**Pierle, Ruth Charlotte,** University of Cincinnati, Cincinnati, Ohio.

**Reinschreiber, James Earl,** Los Alamos Scientific Laboratory, Los Alamos, New Mexico.

**Richards, John Cadwallader,** Film Department, E. I. duPont de Nemours and Company, Buffalo, New York.

**Rothrock, John Williams,** Merck and Company, Incorporated, Rahway, New Jersey.

**Rothstein, Morton,** University of Rochester, Rochester 20, New York.

**Ruyle, William Vance,** Merck and Company, Incorporated, Rahway, New Jersey.

**Scott, Donald Strong,** Department of Chemistry, University of British Columbia, Vancouver, British Columbia.

**Seven, Raymond Peter,** Edwal Laboratories, Chicago 5, Illinois.

**Shealy, Yoder Fulmer,** Upjohn Company, Kalamazoo, Michigan.

**Shen, Elizabeth Heng-Hui** (Mrs. Arthur Lo), 111-D Wallworth Park Apartments, Park Boulevard, Haddonfield, New Jersey.

**Shields, Donald James,** Tennessee Eastman Corporation, Kingsport, Tennessee.

**Shoemaker, Carlyle Edward,** Monsanto Chemical Company, Miamisburg, Ohio.

**Shoemaker, Gradus Lawrence,** Department of Chemistry, University of Louisville, Louisville, Kentucky.

**Simonsen, Stanley Harold,** Department of Chemistry, University of Texas, Austin 12, Texas.

**Smith, Leonard Charles,** Hines Veteran Administration Hospital, Hines, Illinois.

**Sprague, Robert Steacy,** Harvard University, 15 Coolidge Laboratory, Cambridge 38, Massachusetts.

**Swaminathan, Sambasiva,** Department of Chemistry, Ohio State University, Columbus, Ohio.

**Tavormina, Peter Albert,** Sharpe and Dohme, Incorporated, Glenolden, Pennsylvania.

**Thompson, Crayton Beville,** Eastman Kodak Company, Rochester 4, New York.

**Trevoy, Donald James,** Eastman Kodak Company, Rochester 4, New York.

**Tull, Roger James,** Merck and Company, Incorporated, Rahway, New Jersey.

**Underhill, Elizabeth Joyce** (Mrs. Morton Harfenist), The Rockefeller Institute for Medical Research, New York 21, New York.

**Verbanac, Frank,** Merck and Company, Incorporated, Elkton, Virginia.

**Vial, Theodore Merriam,** American Cyanamid Company, Stamford, Connecticut.

**Wallace, David Jefferson,** Tennessee Eastman Corporation, Rochester, New York.

**Weiss, Benjamin,** Harper Hospital, Detroit 1, Michigan.

**Werber, Frank Xavier,** B. F. Goodrich Company, Brecksville, Ohio.

**Wildman, William Cooper,** Department of Chemistry, Princeton University, Princeton, New Jersey.

**Wyld, Gerrard Ernest Alfred,** Shell Development Company, Emeryville, California.

**Zirkle, Charles Leon,** Smith, Kline and French Laboratories, Philadelphia 1, Pennsylvania.

## CLASS OF 1950

**Adams, Robert McLean,** Minnesota Mining and Manufacturing Company, St. Paul 6, Minnesota.

**Anderegg, Arnold Henry,** Shell Chemical Corporation, Houston 1, Texas.

**Anderson, John Lynde,** Chemical Department, Experimental Station, E. I. duPont de Nemours and Company, Wilmington, Delaware.

**Asselin, George Francis,** Humble Oil and Refining Company, Baytown, Texas.

**Bluestein, Claire,** Building 16, Apartment 8, Ross-Ade Drive, West Lafayette, Indiana.

**Bohon, Robert Lynn,** The Anderson Physical Laboratory, Champaign, Illinois.

**Burnett, George Hilgard,** University of Chicago, Medical School, Chicago 37, Illinois.

***Buyers, Archie Girard,** Colgate-Palmolive-Peet Company, Jersey City, New Jersey.

**Caesar, Philip Dorion,** Socony-Vacuum Oil Company, Incorporated, Paulsboro, New Jersey.

**Campbell, William Munro,** National Research Council, Chalk River, Ontario, Canada.

**Carnahan, Robert Edward,** Charles Pfizer and Company, Incorporated, Groton, Connecticut.

**Celmer, Walter Daniel,** Charles Pfizer and Company, Incorporated, Brooklyn 6, New York.

**Coker, James Newton,** Electrochemicals Department, E. I. duPont de Nemours and Company, Niagara Falls, New York.

**Coraor, George Robert,** Massachusetts Institute of Technology, Cambridge, Massachusetts.

**Crawford, Jean Veghte,** Department of Chemistry, Wellesley College, Wellesley, Massachusetts.

**DeWald, Horace Albert,** General Aniline and Film Corporation, Easton, Pennsylvania.

**DeWalt, Harry Albert, Jr.,** Department of Chemistry, University of Wisconsin, Madison, Wisconsin.

**Dexter, Theodore Henry,** Mathieson Chemical Corporation, Niagara Falls, New York.

**Eichhorn, Gunther Louis,** Department of Chemistry, Louisiana State University, Baton Rouge, Louisiana.

**Ekman, Frank Oscar,** Howard Smith Paper Mills, Limited, Cornwall, Ontario, Canada.

**Englund, Bruce Emerson,** Chemical Department, Experimental Station, E. I. duPont de Nemours and Company, Wilmington, Delaware.

**Fairbanks, Charles William,** Polychemicals Department, Experimental Station, E. I. duPont de Nemours and Company, Wilmington, Delaware.

**Frajola, Walter J.,** Department of Physiological Chemistry, Ohio State University, Columbus 10, Ohio.

**Fuchs, Jacob,** Department of Physical Science, Arizona State College, Tempe, Arizona.

**Giller, Edward Bonfoy,** P. O. Box 2610, United States Air Force, Washington 25, D. C.

**Goode, William Edward,** Office of Rubber Reserve, Research and Development Division, 811 Vermont Street, NW, Washington 25, D. C.

**Grant, Norman Howard,** Armour and Company, Chicago, Illinois.

**Greenwell, Benjamin Elmer,** Abbott Laboratories, North Chicago, Illinois.

**Grimmett, Howard Lee,** Shell Development Company, Emeryville, California.

**Hatfield, Marshall Raymond,** Minnesota Mining and Manufacturing Company, St. Paul 1, Minnesota.

**Heneghan, Leo Francis,** Merck and Company, Incorporated, Rahway, New Jersey.

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**Hill, Harold Wayne, Jr.,** Rayon Department, Pioneering Research Section, Experimental Station, E. I. duPont de Nemours and Company, Wilmington, Delaware.

**Hudgens, Claude Ray,** Department of Chemistry, University of Illinois, Urbana, Illinois.

**Huselton, Joseph Pearson,** Department of Chemistry, West Virginia University, Morgantown, West Virginia.

**Jackson, Dale Edward,** Rayon Department, Pioneering Research Section, Experimental Station, E. I. duPont de Nemours and Company, Wilmington, Delaware.

**Kauffman, Harry F., Jr.,** The Cockerell Company, Greenwood, Virginia.

**Koeppe, Roger Erdman,** Medical School, University of Tennessee, Nashville, Tennessee.

**Kohan, Melvin Ira,** Polychemicals Department, E. I. duPont de Nemours and Company, Wilmington, Delaware.

**Kohn, Paul,** College of Medicine, University of Illinois, Chicago, Illinois.

**Kotch, Alex,** Chemicals Department, Experimental Station, E. I. duPont de Nemours and Company, Wilmington, Delaware.

**Lata, Gene Frederick,** Department of Biochemistry, State University of Iowa, Iowa City, Iowa.

**McClelland, Alan Lindsay,** Department of Chemistry, University of Connecticut, Storrs, Connecticut.

**Mader, Paul Miller,** Eastman Kodak Company, Rochester 4, New York.

**Mann, David Jacob,** Atlantic Research Corporation, Alexandria, Virginia.

**Meikle, Richard William,** Department of Chemistry, University of Washington, Seattle 5, Washington.

**Mellow, Ernest Wesley,** College of Engineering, University of Missouri, Columbia, Missouri.

**Miller, William Reidel,** Electrochemical Department, E. I. duPont de Nemours and Company, Niagara Falls, New York.

**Mohr, Paul Harmon,** Linde Air Products Company, Tonawanda, New York.

**Nagarkatti, Anant Shantaram,** Department of Chemical Technology, University of Bombay, Matunga Road, Bombay 19, India.

**Norman, Noel Edward,** Research Division, Australian Paper Manufacturers, Ltd., South Melbourne, Australia.

**Ondrejcin, John Jerry,** Polychemicals Department, Experimental Station, E. I. duPont de Nemours and Company, Wilmington, Delaware.

**Onstott, Edward Irwin,** Los Alamos Scientific Laboratory, Los Alamos, New Mexico.

**Osterheld, Robert Keith,** Department of Chemistry, Cornell University, Ithaca, New York.

**Pizzolato, Philip Joseph,** Naval Research Laboratory, Washington, D. C.

**Poos, George Ireland,** Merck and Company, Incorporated, Rahway, New Jersey.

**Rands, Robert Delafield, Jr.,** Mallinckrodt Chemical Works, St. Louis 7, Missouri.

**Rosenberg, Harold,** Department of Chemistry, Purdue University, West Lafayette, Indiana.

**Rotariu, George J.,** Department of Chemistry, University of California, Berkeley 4, California.

**Sallach, Henry James,** Medical School, University of Colorado, Denver, Colorado.

**Schaap, Ward Beecher,** Department of Chemistry, Indiana University, Bloomington, Indiana.

**Stone, Hyman Nathan,** Norton Company, Worcester, Massachusetts.

**Swoboda, Thomas James,** Chemical Department, Experimental Station, E. I. duPont de Nemours and Company, Wilmington, Delaware.

**Takemura, Kazuo Horace,** Department of Chemistry, Ohio State University, Columbus 10, Ohio.

**Taylor, John Frederick,** Shell Development Company, Emeryville, California.

**Toomey, Robert Daniel,** National Lead Company, South Amboy, New Jersey.

**Watson, Harold John,** The Texas Company, Beacon, New York.

**Young, Charles Herbert,** Carbide and Carbon Chemicals Division, Union Carbide and Carbon Corporation, South Charleston 3, West Virginia.

## FEBRUARY, 1951

**Elslager, Edward Faith,** Associate Research Chemist, Parke, Davis and Company, Detroit 32, Michigan.

**Heumann, Karl Frederich,** Minnesota Mining and Manufacturing Company, St. Paul, Minnesota.

**Hoffman, Charles John,** Los Alamos Scientific Laboratory, Los Alamos, New Mexico.

**McCormick, Mack H.,** Research Chemist, Eli Lilly and Company, Indianapolis, Indiana.

**Mattson, Raymond Harding,** American Cyanamid Company, Stamford, Connecticut.

**Peterson, Janet Brooks,** General Aniline and Film Corporation, New York, New York.

**Riener, Edward Francis,** Rohm and Haas Company, Philadelphia, Pennsylvania.

# Geographical Distribution

## ALABAMA

### Anniston
Chadwick, D. H., 1946
Saunders, J. H., 1946

### Auburn
Hughes, Gordon, 1931

### Decatur
Johnson, Robert, 1936

### Huntsville
Butterbaugh, D. J., 1938

## ARIZONA

### Tempe
Fuchs, J., 1950

### Tuscon
Rhodes, H. D., 1939

## ARKANSAS

### Crossett
Sandborn, L. T., 1927

### Fayetteville
Lenoir, J. M., 1949

## CALIFORNIA

### Albany
Copley, M. J., 1929
Corse, J. W., 1940

### Azusa
Gold, M. H., 1940

### Berkeley
Briggs, S. W., 1941
Fraser, Dean, 1941
Huffman, E. H., 1937
Okey, Ruth E., 1918
Rotariu, G. J., 1950
Stanley, W. M., 1929

### China Lake
Shenk, J. H., 1937

### Emeryville
Baron, Thomas, 1946
Condo, F. E., 1936
Grimmett, H. L., 1950
Maycock, R. L., 1941
Mecorney, J. W., 1944
Morris, R. C., 1936
Ross, W. E., 1937
Smith, C. W., 1943
Taylor, J. F., 1950
Wyld, G. E. A., 1949

### Inyokern
Cohen, A. J., 1949
DeVries, J. E., 1944

### Los Angeles
Dunn, M. S., 1921
Hall, H. K., 1949
Griffith, W. H., 1923
Lehman, M. R., 1933
Leppla, P. W., 1937
Steinman, Robert, 1942

### Modesto
Sutherland, H. K., 1938

### Pasadena
Bates, S. J., 1912

### Richmond
Burton, A. A., 1934
Dietz, F. C., 1941
LeTourneau, R. L., 1942
Stephenson, R. W., 1942

### San Diego
Laddington, A. W., 1933

### San Francisco
Shields, J. B., 1935
Spealman, M. L., 1935

### San Jose
Clark, H. M., 1940

### Santa Barbara
Braham, J. M., 1918

### Stanford
Himel, Chester, 1942
Loring, H. S., 1934
Noller, C. R., 1926
Parks, T. D., 1945
Skoog, D. A., 1943

## COLORADO

### Boulder
Dean, P. M., 1916
Keller, R. N., 1940
Meek, J. S., 1945

### Colorado Springs
Barnes, O. A., 1922

### Denver
Engle, E. A., 1922
Goodman, J. B., 1931
Hill, R. M., 1924
Sallach, H. J., 1950
Schieltz, N. C., 1938

## CONNECTICUT

### East Norwalk
Brooks, L. A., 1941

### Groton
Carnahan, R. E., 1950
Pilgrim, F. J., 1948

### Naugatuck
Coe, W. S., 1936
Sundholm, N. K., 1944
Tuley, W. F., 1926

### New Haven
Mrgudich, J. N., 1933

### Putnam
Muncie, F. W., 1915

### Stamford
Clark, J. H., 1940
Fugate, W. O., 1939
Kell, R. W., 1941
Mattson, R. H., 1951
Thurston, J. T., 1935
Vial, T. M., 1949

### Storrs
McClelland, A. L., 1950

## DELAWARE

### Newark
Pigford, R. L., 1942
Skinner, G. S., 1917
Wood, T. R., 1940

### Wilmington
Albert, A. A., 1942
Aldrich, P. H., 1949
Alexander, L. L., 1936
Anderson, A. W., 1941
Anderson, J. L., 1950
Arnett, L. M., 1941
Babcock, D. F., 1929
Ball, R. W., 1931
Balthis, J. H., 1934
Barthel, Eric, 1949
Beaman, R. G., 1948
Beste, L. F., 1945
Blodgett, F. W., 1948
Bousquet, E. W., 1929
Boyd, S. N., 1945
Brace, N. O., 1948
Brown, M. H., 1934
Brubaker, M. M., 1927
Cairns, T. L., 1939
Campbell, J. B., 1949
Coffman, D. D., 1930
Corner, J. O., 1942

## DELAWARE, continued

### Wilmington, continued

Corson, H. P., 1915
Cupery, M. E., 1930
DeButts, E. H., 1948
Downing, J. R., 1940
Dunlop, E. C., 1942
Ellingboe, E. K., 1934
Englund, B. E., 1950
Enos, H. I., 1946
Eubank, L. D., 1939
Fairbanks, C. W., 1950
Ford, S. G., 1929
Foster, R. E., 1944
Friedrich, M. E., 1929
Goebel, M. T., 1934
Graves, G. D., 1923
Gray, H. W., 1939
Hardy, V. R., 1932
Harmon, Jesse, 1933
Hatchard, W. R., 1944
Heckert, R. E., 1949
Higgins, N. A., 1948
Hill, H. W., 1950
Holmes, D. F., 1934
Hulley, H. H., 1936
Hyson, A. M., 1949
Inskeep, G. E., 1943
Jackson, D. E., 1950
Jackson, H. L., 1949
Johnson, A. A., 1939
Johnson, R. S., 1948
Joyce, R. M., 1938
Kirkpatrick, E. C., 1938
Kneisley, J. W., 1943
Kohan, M. I., 1950
Kotch, A., 1950
Kovacic, Peter, 1946
Lewis, C. D., 1947
Lindsey, R. V., 1941
Lipscomb, R. D., 1944
McGrew, F. C., 1937
McKusick, B. C., 1944
Mackey, B. H., 1930
Maxwell, R. W., 1930
Munn, G. E., 1948
Ondrejcin, J. J., 1950
Oppegard, A. L., 1946
Pierce, N. C., 1949
Pipenberg, K. J., 1946
Robinson, J. C., 1943
Robinson, J. W., 1939
Rossander, S. S., 1930
Salzberg, P. L., 1928
Schertz, G. L., 1943
Scott, S. L., 1940
Scroggie, A. G., 1928
Searle, N. E., 1934
Shackleton, J. W., 1941
Sharkey, W. H., 1941
Sharp, A. G., 1939
Smith, A. F., 1936
Soukup, Roy, 1928
Speck, S. B., 1942
Sperati, C. A., 1941
Sveda, Michael, 1939
Swoboda, T. J., 1950
Taylor, W. H., 1941
Theobald, C. W., 1943
Tordella, J. P., 1944
Ulich, L. H., 1920
Upson, R. W., 1941
Voris, R. S., 1943
Weiland, H. J., 1917
Welldon, P. B., 1942
Wende, C. W. J., 1937
Whitson, J. W., 1943
Youker, M. A., 1929
Young, J. D., 1947

## DISTRICT OF COLUMBIA

### Washington

Alexander, Wyvona B., 1946
Brode, W. R., 1925
Butz, L. W., 1933
Corruccini, R. J., 1942
Deem, A. G., 1934
Fiock, E. F., 1926
Florin, R. E., 1948
Gardner, J. H., 1923
Giller, E. B., 1950
Ginnings, D. C., 1929
Goode, W. E., 1950
Holton, W. B., 1926
Leslie, R. T., 1928
Littleton, L. R., 1912
Maclean, Marion E., 1933
Meyers, E. L., 1934
Naeser, C. R., 1935
Patterson, W. I., 1934
Pizzolato, P. J., 1950
Shelton, G. R., 1922
Wells, L. S., 1919
Wichers, Edward, 1917
Womack, Madelyn, 1935

## FLORIDA

### Tallahassee

Keirs, R. J., 1941

### Winter Park

Bell, J. E., 1913
Tanner, F. W., 1916
Tanner, Louise P., 1938
Wager, R. W., 1939

## GEORGIA

### Atlanta

Hine, J. S., 1948

### Macon

Hyde, Elizabeth C., 1925

## ILLINOIS

### Argo

Elder, A. L., 1929
Faith, W. L., 1932

### Calumet City

Tschentke, H. L., 1929

### Carbondale

Abbott, T. W., 1928
Neckers, J. W., 1927
Scott, R. A., 1933

### Champaign

Bohon, R. L., 1950
Kimpton, D. D., 1949
Nickell, L. F., 1913

### Charleston

Phipps, H. E., 1931

### Chicago

Arvin, J. A., 1928
Ashley, W. C., 1935
Black, H. C., 1938
Burk, E. H., 1949
Burnett, G. H., 1950
Butler, Sister M. Josetta, 1939
Byman, Leonard, 1940
Cataldi, H. A., 1949
Chandler, E. M. A., 1917
Cole, J. W., 1938
Delbecq, C. J., 1949
Dixon, A. L., 1927
Dobry, L. F., 1935
Doty, J. R., 1933
Duffey, H. R., 1933
Ernest, T. R., 1910
Geiling, E. M. K., 1917
Grant, N. H., 1950
Hagan, Sister Mary M., 1949
Henry, R. E., 1938
Huizenga, J. R., 1949
Kohn, Paul, 1950
Kott, A. E., 1940
Langdon, W. M., 1941
Lockhart, H. B., 1945
Meints, R. E., 1932
Mohlman, F. W., 1916
Mueller, M. H., 1949
Norris, W. P., 1944
Peppard, D. F., 1939
Rice, E. E., 1938
Riegel, E. B., 1935
Sample, J. H., 1939
Schaad, J. A., 1936
Schneider, R. F., 1922
Seven, R. P., 1949
Silbergeld, Sam, 1943

Simpson, O. C., 1934
Sollo, F. W., 1948
Thorn, R. J., 1942
Westhafer, T. O., 1918
Whitehill, L. N., 1941
Wilson, W. C., 1922
Winkelmann, H. A., 1919

**Chicago Heights**
Toy, A. D. F., 1942

**Danville**
Henry, W. F., 1932

**Decatur**
Berger, Arthur, 1940
Greenfield, R. E., 1921
Hatfield, W. D., 1918
Shildneck, P. R., 1932

**East St. Louis**
Dial, R. E., 1948

**Evanston**
Basolo, Fred, 1943
Selwood, P. W., 1931

**Galesburg**
Gunther, J. K., 1936
Gunther, R. C., 1942

**Harvey**
Chambers, R. R., 1947
Friedman, B. S., 1936
Gring, J. L., 1936
May, R. L., 1939

**Hines**
Smith, L. C., 1949

**Jacksonville**
Bailey, W. F., 1933
Glick, F. J., 1943

**Joliet**
Preising, Sister M. Joan, 1940

**La Grange**
Layng, T. E., 1916

**Lake Forest**
North, E. O., 1925

**Macomb**
Bennett, C. W., 1930

**Maywood**
Todd, H. R., 1937

**Naperville**
Koten, I. A., 1924

**Normal**
Griffith, Esther M., 1930

**North Chicago**
Beck, K. M., 1948
Clark, R. K., 1948
Driggs, F. H., 1924
Greenwell, B. E., 1950
Knauf, A. E., 1933
Lambert, G. F., 1944
Leffler, M. T., 1936
Matson, E. J., 1939
Paik, A. J., 1937
Volwiler, E. H., 1918
Yntema, L. F., 1921

**Peoria**
Baker, P. S., 1943
Boruff, C. S., 1931
Cowan, J. C., 1938
Jackson, R. W., 1925
Jeanes, Allene R., 1938
Kretschmer, C. B., 1941
Nichols, Velma E., 1940
Schniepp, L. E., 1935
Shotwell, Odette L., 1948
Singh, Bhagat, 1940
Teeter, H. M., 1940

**Ringwood**
Kaplan, J. F., 1941

**Riverside**
Bicek, E. J., 1941

**Springfield**
Chiles, H. M., 1922
Dykins, F. A., 1933

**Urbana**
Bartow, Virginia, 1923
Bhattacharyya, P. K., 1949
Bradley, W. F., 1935
Carter, H. E., 1934
Curtin, D. Y., 1945
Englis, D. T., 1916
Finger, G. C., 1938
Hudgens, C. R., 1950
Larson, T. E., 1937
Marvel, C. S., 1920
Mitchell, H. H., 1915
Nalbandov, Olga O., 1946
Parr, Rosalie M., 1916
Rees, O. W., 1931
Smith, Janice M., 1937
Sullivan, V. R., 1939
Whitney, R. M., 1944
Yohe, G. R., 1929

**West Chicago**
Kremers, H. E., 1944
Scribner, L. R., 1936

**Wheaton**
Fiess, H. A., 1944

## INDIANA

**Bloomington**
Fischer, R. B., 1946
Schapp, W. B., 1950
Seifert, R. L., 1937

**Crawfordsville**
Howell, L. B., 1919

**Crown Point**
Merchant, Raymond, 1928

**Elkhart**
Mirza, John, 1949

**Evansville**
Kemmerer, K. S., 1936

**Franklin**
Hicks, R. L., 1939

**Indianapolis**
Behrens, O. K., 1935
Bottorff, E. M., 1941
Flynn, E. H., 1949
Kern, S. F., 1941
Kleiderer, E. C., 1933
McCormick, M. H., 1951
Mills, Jack, 1945
Pezold, Margaret A., 1934
Porter, H. D., 1947
Rieger, W. H., 1941
Scholl, C. E., 1916
Soper, Q. F., 1943
VanAbeele, F. R., 1948
VanArendonk, A. M., 1935
VanHeyningen, E. M., 1946

**Lafayette**
Bluestein, B. R., 1949
Brandt, W. W., 1949
Brewster, J. H., 1948
Corley, R. C., 1924
DeVries, Thomas, 1927
Kornblum, Nathan, 1940
Mertz, E. T., 1935
Rosenberg, Harold, 1950

**Lawrenceburg**
Katz, Leon, 1947

**North Salem**
Hadley, H. F., 1914

**Notre Dame**
Eliel, E. L., 1948
Quagliano, J. V., 1946

**Richmond**
Wildman, E. A., 1922

**Terre Haute**
Egly, R. S., 1940
McMillan, G. W., 1941

## INDIANA, continued

### West Lafayette
Bluestein, Claire, 1950

### Whiting
Burdett, L. W., 1949
Burney, D. E., 1941
DenHerder, Marvin, 1944

## IOWA

### Ames
Duke, F. R., 1940
Fritz, J. S., 1948
Goetz, C. A., 1938

### Iowa City
Berg, C. P., 1929
Lata, G. F., 1950
Mattill, H. A., 1910
Olin, H. L., 1914
Shriner, R. L., 1925

### Pella
Keizer, C. R., 1943

## KANSAS

### Lawrence
Kleinberg, Jacob, 1939

### Manhattan
Colver, C. W., 1919
Hall, J. L., 1922
Leaf, Boris, 1942
VanWinkle, W. A., 1920
Westerman, Beulah D., 1928

### Wichita
Burnett, W. B., 1923

## KENTUCKY

### Lexington
Wagner, W. F., 1947

### Louisville
Cooke, H. G., 1940
Homberger, A. W., 1910
Shoemaker, G. L., 1949

### Murray
Blackburn, W. E., 1944

## LOUISIANA

### Baton Rouge
Adams, C. E., 1944
Eichhorn, G. L., 1950
Kramer, Margaret D., 1946
Krebs, R. W., 1937
Nommensen, E. W., 1949
Tenney, H. M., 1938

### Lafayette
Bernays, P. M., 1942

### New Orleans
Fisher, C. H., 1932
Jonassen, H. B., 1946
Martin, L. F., 1928

## MAINE

### Orono
Nelson, N. K., 1949

## MARYLAND

### Army Chemical Center
Butler, C. L., 1925

### Beltsville
Howe, P. E., 1910

### Bethesda
Bond, H. W., 1941
Horning, E. C., 1940
Schrecker, A. W., 1948
White, Julius, 1931

### College Park
Bailey, W. J., 1946
Rollinson, C. L., 1939

### Frederick
Hufferd, R. W., 1920

## MASSACHUSETTS

### Amherst
Cannon, G. W., 1943

### Cambridge
Coraor, G. R., 1950
Handrick, G. R., 1942
Millard, E. B., 1914
Sprague, R. S., 1949
Trumbull, E. R., Jr., 1947

### Charleston
Rowland, F. E., 1918

### Needham
Hager, F. D., 1926

### South Hadley
Pickett, Lucy W., 1930

### Watertown
Owens, A. W., 1918

### Wellesley
Crawford, Jean V., 1950

### Worcester
Chapin, J. H., 1939
Stone, H. N., 1950

## MICHIGAN

### Ann Arbor
Boyer, J. H., 1949
Christman, A. A., 1922
Parry, R. W., 1946

### Detroit
Bartz, Q. R., 1935
Coleman, G. H., 1921
Corrigan, K. E., 1932
Elslager, E. F., 1951
Hayden, Henrietta S., 1934
Jones, V. V., 1949
Kamm, Oliver, 1915
Krohn, I. T., 1941
Kurt, O. E., 1930
Maxwell, R. E., 1947
Moore, A. C., 1948
Ogden, Katharine, 1923
Rebstock, Mildred C., 1945
Sherwood, G. R., 1929
Weiss, Benjamin, 1949

### East Lansing
Byerrum, R. U., 1947
McCarty, C. N., 1935
Quill, L. L., 1928
Schlegel, Richard, 1943

### Ferndale
Brown, J. E., 1949

### Grand Rapids
De Vries, John, 1933
Velzen, B. H., 1945
Wolthuis, Enno, 1937

### Holland
Kleinheksel, J. H., 1927

### Kalamazoo
Anderson, H. V., 1949
Caldwell, C. T., 1932
Eppstein, S. H., 1936
Ford, J. H., 1936
Haines, W. J., 1943
Hamlin, W. E., 1949
Harkema, James, 1941
Hinman, J. W., 1947
Jackson, W. G., 1946
Johnson, J. L., 1949
Koehneke, J. H., 1949
Kolloff, H. G., 1936
Leach, B. E., 1944
McIntosh, A. V., 1942
Meyer, C. E., 1935
Meyer, Lillian H., 1937
Moffett, R. B., 1941
Nielson, E. D., 1948
Reitsema, R. H., 1945
Schreiber, R. S., 1935
Shealy, Y. F., 1949

Shepherd, D. A., 1944
Spradling, A. B., 1944
Woodruff, E. H., 1932

**Midland**
Coleman, G. H., 1928
Dankert, L. J., 1940
Drake, L. R., 1937
Drake, S. S., 1943
Humiston, C. G., 1949
Johnson, J. E., 1943
Jones, G. D., 1942
Ryden, L. L., 1937
Stearns, H. A., 1930

**Pontiac**
Ford, J. T., 1918

**Ypsilanti**
Sellers, J. A., 1930

## MINNESOTA

**Minneapolis**
Arnold, R. T., 1937
Brasted, R. C., 1942
O'Brien, T. D., 1941
Parham, W. E., 1946
Warner, D. T., 1943

**St. Paul**
Adams, R. M., 1950
Burtle, J. G., 1937
Freier, H. E., 1946
Hatfield, M. R., 1950
Hendricks, J. O., 1936
Heumann, K. F., 1951
Lundquist, W. E., 1938
Miller, M. W., 1940
Sohl, W. E., 1933

## MISSISSIPPI

**State College**
Behr, L. C., 1941

## MISSOURI

**Columbia**
Mellow, E. W., 1950
Rabjohn, Norman, 1942
Stearn, A. E., 1919

**Joplin**
Thompson, A. P., 1925

**St. Louis**
Ball, T. R., 1916
Dobratz, E. H., 1940
Goehler, O. E., 1931
Guthric, D. B., 1945
Jenkins, R. L., 1923
King, G. L., 1949
Patterson, L. A., 1941
Rands, R. D., 1950
Rodewald, C. W., 1925
Spcziale, A. J., 1948
Stoughton, R. W., 1932
Wood, L. J., 1924

## MONTANA

**Bozeman**
Binder, L. O., 1941
Crosby, Janet L., 1948

**Butte**
Koch, E. G., 1933

**Missoula**
Howard, J. W., 1915
Stewart, J. M., 1944

## NEBRASKA

**Lincoln**
Holtzclaw, H. F., 1947

## NEVADA

**Reno**
Moose, J. E., 1924
Sears, G. W., 1914
Williams, L. R., 1939

## NEW JERSEY

**Bloomfield**
Krebs, K. F., 1940
Rugg, F. M., 1941
Taebel, W. A., 1938

**Bound Brook**
Denton, J. J., 1941
Hein, D. W., 1947
Long, R. S., 1940
Shivc, R. A., 1925
Stewart, H. W., 1941
Tarvin, Donald, 1933

**Camden**
Windus, Wallace, 1931

**Cranford**
Hancock, Evelyn M., 1936

**Deepwater**
Parsons, Theophilus, 1934

**Dover**
Lloyd, B. A., 1944

**Edgewater**
Mueller, M. B., 1939

**Gibbstown**
Wahl, M. H., 1933

**Grasselli**
Graham, D. E., 1940
Grosser, Frederick, 1941
Lawler, J. C., 1942
Welch, Eldred, 1941
Woodward, F. E., 1946

**Haddonfield**
Shen, Elizabeth H., 1949

**Harrison**
Sprules, F. J., 1940

**Hawthorne**
Wicks, Z. W., 1944

**Jersey City**
Buyers, A. G., 1950
Copenhaver, J. W., 1935
Dreger, E. E., 1924
Epstein, M. B., 1942
Teeters, W. O., 1935
Wearn, R. B., 1941

**Linden**
Banes, F. W., 1943
Barr, F. T., 1934
Baumgartner, F. N., 1948
Dudenbostel, B. F., 1942
Fleming, C. L., 1938
Gallo, S. G., 1943
Kearby, K. K., 1937
McPherson, J. B., 1948
Patberg, J. B., 1942
Smith, P. V., 1945
Sparks, W. J., 1936

**Manville**
Dec, Joseph, 1940

**Morris Plains**
Phillips, G. E., 1944

**Morristown**
Deanin, Rudolph, 1944
Eck, J. C., 1935
Nesty, G. A., 1937
Weinstock, H. H., 1937

**Murray Hill**
Sparks, M. M., 1943

**Newark**
Cross, J. M., 1937
Jackson, A. O., 1934
Wilson, T. A., 1923

**New Brunswick**
Borman, Aleck, 1945
Bull, B. A., 1934
Gander, R. J., 1944
Gordon, J. R., 1949
Lycan, W. H., 1929
Sweet, R. S., 1932

## NEW JERSEY, continued

### Nutley
Rachlin, A. I., 1942

### Parlin
Warfield, P. F., 1944

### Passaic
Ewart, R. H., 1934
Little, J. R., 1938

### Paulsboro
Caesar, P. D., 1950
Meisel, S. L., 1947
Richter, F. P., 1941

### Princeton
Wildman, W. C., 1949

### Rahway
Beyler, R. E., 1949
Chase, R. G., 1943
Garber, J. D., 1943
Heneghan, L. F., 1950
Howe, E. E., 1940
Jones, R. E., 1945
Phillips, R. F., 1942
Poos, G. I., 1950
Rothrock, J. W., 1949
Ruyle, W. V., 1949
Silcox, H. E., 1943
Tull, R. J., 1949
Wolf, D. E., 1939
Wolf, F. J., 1942

### Raritan
Harmison, C. R., 1941

### Sewaren
Derick, C. G., 1910

### Short Hills
Stouder, Florence D., 1925

### South Amboy
Michels, L. R., 1941
Toomey, R. D., 1950

### Summit
Marsh, J. L., 1941
Ziegler, J. B., 1946

### Trenton
Ruberg, Leone A., 1937
Troxel, Shirley M., 1930

### Upper Montclair
Gordon, H. B., 1912

### Westfield
Hanke, A. R., 1939
Sparks, Meredith P., 1936

## NEW MEXICO

### Albuquerque
Reynolds, D. H., 1936

### Los Alamos
Hoffman, C. J., 1951
Holley, C. E., 1940
Onstott, E. I., 1950
Penneman, R. A., 1947
Reinschreiber, J. E., 1949
Roy, M. F., 1937
Spence, R. W., 1939

## NEW YORK

### Alfred
Levine, H. S., 1948

### Beacon
Becker, H. C., 1940
Berry, R. E., 1949
Watson, H. J., 1950

### Brooklyn
Celmer, W. D., 1950
Harfenist, Morton, 1948
Kaplan, William, 1943
Libman, E. E., 1922
O'Shaughnessy, M. T., 1940
Overberger, C. G., 1944

### Buffalo
Burton, R. L., 1946
Hess, R. W., 1916
Langley, W. D., 1922
Light, R. E., 1949
Mattern, J. A., 1946
Porter, P. K., 1923
Richards, J. C., 1949
Shaw, E. J., 1930
Walters, E. G., 1930
Ward, M. L., 1942

### Corning
Claussen, W. F., 1939
Hyde, J. F., 1928

### Glens Falls
Gray, A. R., 1934

### Greenwich
Johnson, E. H., 1931

### Ithaca
Blomquist, A. T., 1932
Johnson, J. R., 1922
Krigbaum, W. R., 1949
Osterheld, R. K., 1950

### Keuka Park
Lougee, F. Marion, 1924

### New York
Althausen, D., 1932
Brown, G. B., 1938
Browning, Eugene, 1931
Bunney, W. E., 1927
Edwards, G. P., 1923
Fogler, M. F., 1923
Gillespie, H. B., 1930
Goebel, W. F., 1923
Haas, Dorothea, 1932
Hanford, W. E., 1935
Kendall, F. E., 1926
Littman, E. R., 1929
MacInnes, D. A., 1911
Maynert, E. W., 1945
Meltzer, R. I., 1943
Melville, D. B., 1939
Nathan, M. F., 1948
Peterson, Janet B., 1951
Peterson, J. M., 1927
Rassweiler, C. F., 1924
Rippie, C. W., 1926
Sterrett, R. R., 1936
Symons, G. E., 1932
Underhill, Elizabeth J., 1949
Upton, W. V., 1937
Wyman, F. W., 1944
Yuska, Henry, 1942
Zimmer, J. C., 1931

### Niagara Falls
Brown, J. H., 1937
Coker, J. N., 1950
Dearborn, R. J., 1945
Dexter, T. H., 1950
Emmick, R. D., 1946
Klabunde, Walter, 1933
Michalek, J. C., 1927
Miller, W. R., 1950
Pinkney, P. S., 1937
Robertson, J. A., 1942
Stiegman, C. A., 1937

### Pearl River
Babcock, S. H., 1934
Baker, B. R., 1940

### Potsdam
Reed, J. B., 1935

### Poughkeepsie
Ellis, Ruth H., 1930
Hillis, Mary O., 1944

### Rensselaer
Rees, E. A., 1918
Wallace, W. E., 1944
Witte, Michael, 1941

### Ridgewood
Wierda, John, 1925

### Rochester
Burness, D. M., 1945
Claus, C. J., 1948
Damschroder, R. E., 1937
Elins, H. S., 1949
Feldman, Isaac, 1947
Fierke, S. S., 1936

Glass, D. B., 1939
Hale, J. B., 1933
Hiatt, G. D., 1936
Ladd, J. H., 1947
Leubner, G. W., 1949
Mader, P. M., 1950
Merling, Ruth E., 1920
Miller, R. F., 1937
Moon, N. S., 1939
Munro, H. E., 1932
Parmerter, S. M., 1944
Phillips, R. R., 1949
Quaife, Mary L., 1942
Roll, L. J., 1931
Rothstein, Morton, 1949
Spangler, F. W., 1944
Stampfli, J. G., 1931
Thompson, C. B., 1949
Trevoy, D. J., 1949
Van Campen, J. H., 1938
Wallace, D. J., 1949
Williams, J. L. R., 1948

**Schenectady**
Charlton, E. E., 1918
Elliott, J. R., 1943
Matheson, A. R., 1938
Meyers, R. L., 1947
Navias, Louis, 1923
Sears, G. W., 1942
Turnbull, David, 1939
Walton, W. L., 1941

**Staten Island**
Egan, J. E., 1912

**Syracuse**
Byers, L. W., 1948
Grillot, G. F., 1940
Hopper, I. R., 1944
Risser, W. C., 1940

**Tonawanda**
Brantley, J. C., 1949
Brimm, E. O., 1940
Mohr, P. H., 1950

**Troy**
Herbrandson, H. F., 1945
Holland, W. E., 1937
Ross, Sydney, 1940

**Tuckahoe**
Davies, Letha A., 1928

**Upton**
Sacks, Jacob, 1926
Winsche, W. E., 1943

**Waterford**
Sauer, R. O., 1941

## NORTH CAROLINA

**Durham**
Handler, Philip, 1939

**Enka**
Williamson, Barbara M., 1941

**Greensboro**
Ginnings, P. M., 1922

**Winston-Salem**
Markunas, P. C., 1940

## NORTH DAKOTA

**Fargo**
Treumann, W. B., 1947

## OHIO

**Akron**
Best, C. E., 1943
Brock, M. J., 1946
Gruber, E. E., 1937
Keplinger, O. C., 1949
Partridge, E. G., 1927
Wakefield, L. B., 1942

**Barberton**
Becker, C. B., 1932
Dial, W. R., 1939

**Berea**
Jensen, A. R., 1942

**Brecksville**
Gibbs, C. F., 1935
Tyler, W. P., 1938
Werber, F. X., 1949

**Chillicothe**
Robinson, J. V., 1940

**Cincinnati**
Allen, R. E., 1944
Painter, C. L., 1949
Pierle, Ruth C., 1949

**Cleveland**
Armstrong, L. J., 1942
Beckwith, M. M., 1937
Hovorka, Frank, 1925
Kremers, H. C., 1917
Martin, Dorothy E., 1945
Mastin, T. W., 1942
Mudrak, Anton, 1949
Shenk, W. J., 1944
Vandaveer, F. E., 1925
Veraguth, A. J., 1943
Weast, R. C., 1943

**Columbus**
Brown, J. B., 1921
Eckert, A. C., 1945
Frajola, W. J., 1950
Harder, O. E., 1915
Nelson, H. W., 1933
Powers, R. W., 1946
Sisler, H. H., 1939
Swaminathan, Sambasiva, 1949
Takemura, K. H., 1950

**Dayton**
Arvan, P. G., 1949
Callis, C. F., 1948
Clemens, J. E., 1935
Johnson, J. H., 1949
Jukkola, E. E., 1933

**Hamilton**
Heckel, H. C. N., 1924

**Miamisburg**
Pish, George, 1943
Shoemaker, C. E., 1949

**North Canton**
Bixler, M. E., 1936
Coons, C. C., 1928

**Painesville**
Munn, Lottie E., 1924

**Wickliffe**
Shekleton, J. F., 1943

## OKLAHOMA

**Bartlesville**
Clark, Alfred, 1935
Fisher, H. B., 1937
Mayland, B. J., 1943
Rapp, Betty, 1941

**Norman**
Bliss, H. H., 1931
Shead, A. C., 1931
Williams, G. Y., 1913

**Stillwater**
Reder, Ruth E., 1929
Smith, O. M., 1919

**Tulsa**
Kaufmann, R. J., 1923
Meadors, V. G., 1939

## OREGON

**Corvallis**
Clapp, J. T., 1942
Marvell, E. N., 1948

**Eugene**
Gaertner, V. R., 1948

**Portland**
Farley, E. D., 1936

## PENNSYLVANIA

### Bethlehem
Easton, N. R., 1946

### Bristol
Cary, R. C., 1937
Kelton, S. C., 1941

### Clarion
Peirce, D. D., 1932

### Easton
Bauman, R. A., 1946
Chiddix, M. E., 1943
DeWald, H. A., 1950
Godlove, I. H., 1926
Gross, S. T., 1938
Hoch, P. E., 1948
Jelinek, C. F., 1944
Libby, W. H., 1949
Marklein, B. C., 1938
Poland, L. B., 1941
Smith, C. M., 1942
Wilkinson, J. M., 1943
Williams, W. W., 1939

### Glenolden
Land, A. H., 1941
Tavormina, P. A., 1949

### Johnstown
Shafer, W. M., 1940

### Kingston
Horne, W. H., 1933

### Lancaster
Dunlap, L. H., 1939
Sievert, C. F., 1947

### Marcus Hook
Howsman, J. A., 1944
Sisson, W. A., 1931
Werner, C. O., 1933

### Mendenhall
Bateman, Dorothy E., 1927

### Philadelphia
Aycock, B. F., 1947
Bockstahler, T. E., 1949
Boettner, F. E., 1947
Bullitt, O. H., 1945
Coon, M. J., 1946
Denoon, C. E., 1938
Easton, J. T., 1934
Eddy, C. R., 1938
Felley, D. L., 1949
Frederick, D. S., 1934
Glavis, F. J., 1938
Hiers, G. S., 1926
Hollander, Leonore B., 1932
Howard, Edgar, 1946
Hwa, J. C. H., 1949
Kade, C. F., 1941
Lawrenz, Margaret, 1937
Levesque, C. L., 1939
McBurney, C. H., 1939
McKeever, C. H., 1940
Melamed, Sidney, 1944
Riddle, E. H., 1941
Riener, E. F., 1951
Rockwell, Harriet E., 1946
Rouse, P. E., 1941
Rowland, S. P., 1943
Scull, C. W., 1930
Swain, A. P., 1939
Ullyot, G. E., 1938
Woodward, C. F., 1934
Zirkle, C. L., 1949

### Pittsburgh
Braley, S. A., 1917
Coffman, A. W., 1927
Conroy, E. H., 1948
Cox, G. J., 1925
Ludington, R. S., 1944
McCoy, R. H., 1935
McGregor, R. R., 1926
Nicholson, D. G., 1934
Pellegrini, J. P., 1949
Powell, A. R., 1918
Southwick, P. L., 1943
Starr, D. D., 1947

### State College
Block, B. P., 1949
Douglas, B. E., 1949

## RHODE ISLAND

### Kingston
MacKenzie, Scott, 1947

### Providence
Clapp, L. B., 1941
Inskip, R. G., 1949
Murray, L. A., 1934
Parker, E. A., 1937
Roach, P. G., 1940
Strickhouser, S. I., 1926

## SOUTH CAROLINA

### Columbia
Gray, A. E., 1925

## TENNESSEE

### Chattanooga
Gallagher, Milton, 1934

### Kingsport
Gilkey, Russell, 1949
Hasek, R. H., 1943
Kaye, W. I., 1945
McMahon, E. M., 1932
Shields, D. J., 1949

### Knoxville
Mueller, G. P., 1943
Schweitzer, G. K., 1948

### Memphis
Eadcs, C. H., 1948

### Nashville
Brady, St. Elmo, 1916
Ingersoll, A. W., 1922
Koeppe, R. E., 1950
Pearson, D. E., 1940
Touster, Oscar, 1947
West, H. D., 1937

### Oak Ridge
Rowan, Robert, 1940

### Old Hickory
Meier, J. W., 1942

## TEXAS

### Austin
Lochte, H. L., 1922
Peppel, W. J., 1939
Reed, L. J., 1946
Roberts, R. M., 1944
Simonsen, S. H., 1949

### Baytown
Asselin, G. F., 1950

### College Station
Deacon, B. D., 1941
Middleton, E. B., 1938
Page, J. O., 1933

### Dallas
Heuse, E. O., 1914

### Houston
Anderegg, A. H., 1950
Anderson, John, 1938
Guerrant, G. O., 1949
Marshall, C. D., 1949

### La Porte
Foster, H. D., 1937

### Nederland
King, E. P., 1930

### Phillips
Hanmer, R. S., 1946
McBride, J. A., 1944

### San Antonio
Leslie, Ruth E., 1940

## UTAH

### Ogden
Johanson, A. J., 1938

**Salt Lake City**
Armstrong, M. D., 1941
Cagle, F. W., 1946
Dickman, Marion L., 1944

## VIRGINIA

**Alexandria**
Conard, Vera A., 1934
Mann, D. J., 1950

**Charlottesville**
Updike, O. L., 1944

**Elkton**
Verbanac, Frank, 1949

**Falls Church**
Johnson, R. D., 1948

**Greenwood**
Kauffman, H. F., 1950

**Hopewell**
Eyler, R. W., 1944
Fessler, W. A., 1937
Klingelhoefer, W. C., 1932

**Richmond**
Pierce, J. S., 1924

**Waynesboro**
Sampson, H. J., 1946

**Williamsburg**
Sands, G. D., 1945

## WASHINGTON

**Camas**
Moyer, W. W., 1929

**Pullman**
Knoepfelmacher, Augusta, 1948
Nyman, C. J., 1948
Stacy, G. W., 1946
Stevens, C. M., 1941

**Richland**
Hill, O. F., 1948
Pearce, D. W., 1934
Work, J. B., 1942

**Seattle**
Crittenden, A. L., 1947
Hanahan, D. J., 1944
Meikle, R. W., 1950
Powell, S. G., 1920
Yancey, H. F., 1923

**Shelton**
Bock, L. H., 1931
Briggs, B. T., 1938
Holloway, J. H., 1932

## WEST VIRGINIA

**Morgantown**
Huselton, J. P., 1950

**New Martinsville**
Fineberg, Herbert, 1941

**South Charleston**
Fitzpatrick, J. T., 1941
Johnson, P. C., 1944
Manning, W. R., 1944
Thompsen, C. D., 1933
Yarborough, V. A., 1943
Young, C. H., 1950

## WISCONSIN

**Appleton**
Cundy, P. F., 1939
Gallaher, W. U., 1924
Lewis, H. F., 1916

**Madison**
DeWalt, H. A., 1950
McElvain, S. M., 1923
Shannon, W. J., 1941
Williams, J. N., 1948
Woyski, M. M., 1946

**Menasha**
Davis, D. W., 1931

**Milwaukee**
Bauer, W. W., 1923
Eilerman, G. E., 1938
Gauerke, C. G., 1928
Quick, A. J., 1922
Rowland, R. L., 1945

**Racine**
Greenlee, S. O., 1939

**Waukesha**
Kaufmann, W. E., 1923

# *AUSTRALIA*

**Melbourne**
Norman, N. E., 1950

# *CANADA*

## ALBERTA

**Edmonton**
Clark, K. A., 1916

## BRITISH COLUMBIA

**Kyuquot**
Neave, S. L., 1931

**Vancouver**
Harris, J. A., 1926
Scott, D. S., 1949

## ONTARIO

**Chalk River**
Campbell, W. M., 1950

**Cornwall**
Ekman, F. O., 1950

**London**
Gunton, J. A., 1921

## QUEBEC

**Montreal**
Bouthillier, L. P., 1945

# *CHINA*

## CHEKIANG

**Hangchow**
Li, S. H., 1925

## FORMOSA

**Taiwan**
Chien, S. L., 1934
Tsao, June C., 1933

## HOPEH

**Peking**
Chang, Chin, 1933
Chen, K. H., 1945
Chiang, M. C., 1944
Hsing, C. Y., 1936
Yuan, H. C., 1932

## KIANGSU

**Nanking**
Kao, Hung, 1947
Kao, T. Y., 1931
Li, C. C., 1934
Tan, T. L., 1947

**Shanghai**
Chu, Tse-Tsing, 1933

# *DENMARK*

**Copenhagen**
Stent, G. S., 1948

# *ENGLAND*

**Cambridge**
Dekker, C. A., 1947

### *INDIA*

**Bangalore**
Tumminkatti, M. C., 1926

**Bombay**
Nagarkatti, A. S., 1950

**Dehra Dun**
Puntambekar, S. V., 1926

**Hyderabad**
Rao, N. S., 1948

### *JAPAN*

**Yokohama**
Uyei, Nao, 1924

### *SOUTH AFRICA*

**Johannesburg**
Bosman, Vernon, 1922

**Pretoria**
Ross, J. C., 1916

### *WEST AFRICA*

**Liberia**
Kidder, G. A., 1943

## Deceased

Andrews, J. W., 1924
Austin, M. M., 1920
Boss, A. E., 1927
Bradley, M. J., 1921
Burke, C. E., 1911
Calvery, H. O., 1924
Campbell, R. W., 1937
Carothers, W. H., 1924
Cooke, T. G., 1936
Darbyshire, R. W., 1940
Dehn, W. M., 1903
East, E. M., 1907
Engle, E. W., 1916
French, H. E., 1920
Ginsburg, H. M., 1934
Hicks, J. F. G., 1918
Hussey, S. C., 1930
Jacobsen, R. A., 1925
Kern, J. W., 1925
Keyser, L. S., 1938
Klose, T. G., 1947
Knight, H. G., 1917
Kostalek, J. A., 1910
McGregor, H. H., 1914
McReynolds, J. P., 1938
Nichols, W. A., 1930
Peet, C. H., 1923
Potter, R. S., 1913
Rindfusz, R. E., 1919
Ross, E. L., 1912
Scovell, M. A., 1906
Smith, H. A., 1931
Stover, N. M., 1926
Strachan, E. K., 1912
Taylor, J. B., 1926
Tomecko, C. G., 1926
Trowbridge, P. F., 1906
West, D. H., 1935

# APPENDIX

## PUBLICATIONS 1870-1940

## APPENDIX Publications, 1870-1940

The following is a list of publications by members of the Department of Chemistry from its organization to January 1, 1941.

1870

STUART, A. P. S. On the Organic Matter of Soils, Ill. Ind. Univ. 3rd Rept., 291.

1872

STUART, A. P. S. On the Origin and the Physical and Chemical Properties of the Inorganic Matter of Soils, Ill. Ind. Univ. 4th Rept., 180.

1873

STUART, A. P. S. On the Distribution of Nitrous Acid in Plants, Trans. Ill. State Hort. Soc. 7, 244.

1874

STUART, A. P. S. On the Influence of Light in the Growth of Plants, Prairie Farmer.

1878

SCOVELL, M. A. Soil Analysis, Ill. Ind. Univ. Rept., 177.

1880

SCOVELL, M. A. Shrinkage of Corn, Ill. Ind. Univ. Rept., 109. Analyses of Soils from the University Farm, Ill. Ind. Univ. Rept.
WEBER, H. A. Contamination of Well and Cistern Water by Organic Matter, Ill. Ind. Univ. Rept., 103.
WEBER, H. A. Determination of Organic Matter in River Water, etc., Ill. Ind. Univ. Rept., 104.
WEBER, H. A. Notes on Aragonite, Ill. Ind. Univ. Rept., 105.
WEBER, H. A. On the "Flash Test" of Kerosene, Ill. Ind. Univ. Rept., 106.
WEBER, H. A. and SCOVELL, M. A. Chemical Analyses of, and Practical Experiments with, Sorghum Cane, Grown on the University Farm, Ill. Ind. Univ. Rept., 112.

1882

WEBER, H. A. and SCOVELL, M. A. Report on the Manufacture of Sugar, Syrup and Glucose from Sorghum, Ill. Ind. Univ. Rept., 71.

1884

MCMURTRIE, E. M. Chemistry of the Hog, Ill. Ind. Univ. Rept., 153. Supplementary paper. Appendix.

1886

PARR, S. W. A Test of Certain Methods for the Estimation of the Several Albuminoids in Cows' Milk, etc., Am. Chem. J. *7*, 246.

1892

PALMER, A. W. A Note Upon the Reduction of Symmetrical Triamido-Trinitrobenzene, Am. Chem. J. *14*, 377.

1893

PALMER, A. W. and GRINDLEY, H. S. Ueber die oxidation von pentamidobenzol, Ber. *26*, 2304.

1894

PALMER, A. W. Dimethylarsin, Ber. *27*, 1378.

1896

GRINDLEY, H. S. and SAMMIS, J. L. Action of Mercaptids on Quinones, Am. Chem. J. *19*, 290.
PALMER, A. W. and BRENKE, W. C. Ueber Symmetrisches Triamidotoluol, Ber. *29*, 1346.

1897

PALMER, A. W. Chemical Survey of the Water Supplies of Illinois, Univ. of Ill. Water Survey, Bulletin *1*, 98 pp.
PARR, S. W. Sodium Peroxide as a Third Group Reagent, J.A.C.S. *19*, 123.

1898

GRINDLEY, H. S. A Study of Foods. Published by the Dept. of Chem., Univ. of Ill., Circular, 7 pp.

1899

GRINDLEY, H. S. Analysis of Foods. Published by the Dept. of Chem., Univ. of Ill., Circular, 14 pp.

1900

GRINDLEY, H. S. and SAMMIS, J. L. Nutrition Investigations, U. S. Dept. of Agr. Expt. Sta., Bulletin *91*, 1.
PARR, S. W. A New Coal Calorimeter, J.A.C.S. *22*, 646
PARR, S. W. A New Volumetric Method for the Estimation of Copper, J.A.C.S. *22*, 685.

1901

GRINDLEY, H. S., MCCORMACK, H., and PORTER, H. S. Experiments on Losses in Cooking Meats, U. S. Dept. of Agr. Expt. Sta., Bulletin *102*, 1.
PALMER, A. W. and DEHN, W. M. Ueber Primare Arsine, Ber. *34*, 3594.

1902

PALMER, A. W. Chemical Survey of the Waters of Illinois, Rept. for 1892-1902, Univ. of Ill., Bulletin, 254 pp.
PALMER, A. W. Report of the University of Illinois in Chicago Sanitary District Report of Streams Examination, Dec. 1902, pp. 43-96.
PARR, S. W. Chemical Analysis and Heating Value of Illinois Coals, Bull. of Bureau of Labor Statistics, 20th Annual Coal Rept., Springfield, Ill.
PARR, S. W. A Note on the Volumetric Determination of Copper, J.A.C.S. *24*, 580.
PARR, S. W. The Peroxide Calorimeter as Applied to European Coals and Petroleum, J.A.C.S. *24*, 167.
PARR, S. W. and KOCH, F. C. Chemical Composition of Illinois Coals, Bull. of Bureau of Labor Statistics, 20th Annual Coal Rept., Springfield, Ill.

1903

GRINDLEY, H. S. and MOJONNIER, T. The Artificial Method for Determining the Ease and the Rapidity of the Digestion of Meats, The University Studies, Univ. of Ill. *1*, 185.

1904

GRINDLEY, H. S. A Study of the Nitrogenous Constituents of Meats, U. S. Dept. of Agr., Bur. of Chem., Bulletin *81*, 110.
GRINDLEY, H. S. The Nitrogenous Constituents of Flesh, J.A.C.S. *26*, 1086.
GRINDLEY, H. S. and MOJONNIER, T. Experiments on Losses in Cooking Meats, U. S. Dept. of Agr. Expt. Sta., Bulletin *141*, 1.
LINCOLN, A. T. The Ternary System: Benzene, Acetic Acid and Water, J. Phys. Chem. *8*, 248.
LINCOLN, A. T. and BARKER, P. Determination of Phosphates in Natural Waters, J.A.C.S. *26*, 975.

Parr, S. W. Coals of Illinois: Their Composition and Analysis, Univ. of Ill, Studies *1*, 291.
Parr, S. W. Determination of Total Carbon in Coal and Soil, J.A.C.S. *26*, 294.
Parr, S. W. and McClure, C. H. The Photometric Determination of Sulfur in Coal, J.A.C.S. *26*, 1139.
Walton, J. H., Jr. Die Jodionenkatalyse des Wasserstoffsuperoxyds, Z. physik. Chem. *27*, 185.

1905

Curtiss, R. S. A Convenient and Practical Method for Making the Ester of Mesoxalic Acid, Am. Chem. J. *33*, 603.
Dehn, W. M. Primary Arsines, Am. Chem. J. *33*, 101.
Grindley, H. S. Improved Methods for the Analysis of Animal Substances, J.A.C.S. *27*, 658.
Grindley, H. S. and Emmett, A. D. The Chemistry of Flesh. II. Improved Methods for the Analysis of Animal Substances, J.A.C.S. *27*, 658.
Grindley, H. S. and Emmett, A. D. On the Presence of Cottonseed Oil in Lards from Hogs Fed Upon Cottonseed Meal, J.A.C.S. *27*, 263.
Grindley, H. S. and Emmett, A. D. Studies on the Influence of Cooking Upon the Nutritive Value of Meats, U. S. Dept. of Agr. Expt. Sta., Bulletin *162*.
Sammis, J. L. The Action of Mercaptides on Quinones, J.A.C.S. *27*, 1120.
Smith, G. McP. On the Reciprocal Replacement of the Metals in Aqueous Solutions, J.A.C.S. *27*, 540.

1906

Bartow, E. Chemical and Biological Survey of the Waters of Illinois, Rept. for year ending August 31, 1906, Ill. State Water Survey, Bulletin *3*.
Bartow, E. Discussion of Water Softening, Proc. of the Am. Water Works Assoc. *26*, 135.
Bartow, E. The State Water Survey; What It Is and What It Is Doing, 21st Ann. Rept., Ill. Soc. Eng. Surveyors, p. 68.
Bryan, T. J. A Delivery Funnel for Introducing Liquids Under Increased or Diminished Pressure, J.A.C.S. *28*, 80.
Curtiss, R. S. Amine Derivitives of Mesoxalic Esters, Am. Chem. J. *35*, 354.
Curtiss, R. S. The Reaction of Nitrous Anhydride with Ethyl Malonate, Am. Chem. J. *35*, 477.
Dehn, W. M. Eine bequeme urometer-form und eine genaue Abanderung der Hypobromitmethode, Z. anal. Chem. *45*, 604.
Dehn, W. M. and McGrath, S. J. Arsonic and Arsinic Acids, J.A.C.S. *28*, 347.
Dehn, W. M. and Wilcox, B. B. Secondary Arsines, Am. Chem. J. *35*, 1.
Grindley, H. S. and Clark, S. C. Elementary General Chemistry. Published by the Dept. of Chem., Univ. of Ill.
Grindley, H. S. and Clark, S. C. Experiments in General Chemistry. Published by the Dept. of Chem., Univ. of Ill.
Grindley, H. S. and Trowbridge, P. F. The Chemistry of Flesh. IV. A study of the Proteids of Beef Flesh, J.A.C.S. *28*, 469.
Grindley, H. S., Clark, S. C., and Redenbaugh, W. A. Qualitative Chemical Analysis. Rev. Ed. Pub. by Dept. of Chem., Univ. of Ill.
Grindley, H. S. and Emmett, A. D. A Study of the Phosphorus Contents of Flesh, J.A.C.S. *28*, 25.
Parr, S. W. Anthracizing Bituminous Coals, Ill. State Geol. Survey, Bulletin *4*, 196.
Parr, S. W. Chemical Analysis of Certain Coals, Ill. State Geol. Survey, Bulletin *4*, 188.
Parr, S. W., Breckenridge, L. P., and Dirks, H. B. Fuel Tests with Illinois Coals, Univ. of Ill. Eng. Expt. Sta., Bulletin *7*.
Parr, S. W. The Classification of Coals, J.A.C.S. *28*, 1425.
Parr, S. W. The Coals of Illinois, Eng. and Min. J. *81*, 86.
Parr, S. W. Composition and Character of Illinois Coals, Ill. State Geol. Survey, Bulletin *3*, 27.
Parr, S. W. Some Notes on the Service Waters of a Railway System, J.A.C.S. *28*, 640.
Redenbaugh, W. A. Report of Committee on Chemistry Appointed at High School Conference, Feb. 1905, High School Manual issued by Univ. of Ill.
Smith, G. McP. On the Constitution of Amalgams (Prelim. Paper), Am. Chem. J. *36*, 124.
Smith, G. McP. Constitution of Amalgams, Am. Chem. J. *36*, 125.
Woods, H. S. and Koch, W. The Quantitative Estimation of the Lecithans, J. Biol. Chem. *1*, 203.

1907

Balke, C. W. and Clark, S. C. Exercises in General Chemistry, Univ. of Ill.
Bartow, E. Municipal Water Supplies of Illinois, Univ. of Ill. Water Survey, Bulletin *5*.
Bartow, E. The Use of Copper Sulphate in Water Purification, 22nd Ann. Rept. of Ill. Soc. Eng. Surveyors.
Bartow, E. and Lindgren, J. M. Laboratory Experiments in Water Treatment, Proc. Am. Water Works Assoc. *27*, 506.
Bartow, E. and Lindgren, J. M. Some Reactions During Water Treatment, J.A.C.S. *29*, 1293.
Dehn, W. M. Some New Forms of Apparatus, J.A.C.S. *29*, 1052.
Dehn, W. M. A Gasometric Method for the Determination of Hydrogen Peroxide, J.A.C.S. *29*, 1315.
Dehn, W. M. and Heuse, E. O. Decomposition of Hydrated Ammonium Salts, J.A.C.S. *29*, 1137.
Dehn, W. M. and Davis, G. T. An Improved Method for the Preparation of Allyl Chlorides, J.A.C.S. *29*, 1328.
Grindley, H. S. and Emmett, A. D. Chemistry of Flesh. VI. Further Studies on the Application of Folin's Creatin and Creatinin Method to Meats and Meat Extracts, J. Biol. Chem. *3*, 491.
Grindley, H. S., Mojonnier, T., and Porter, H. C. Studies on the Effect of Different Methods of Cooking Upon the Thoroughness and Ease of Digestion of Meat, U. S. Dept. Agr. Expt. Sta., Bulletin *193*, 1.
Grindley, H. S. and Woods, H. S. The Chemistry of Flesh; Methods for the Determination of Creatinin and Creatin in Meats and Their Products, J.Biol. Chem. *2*, 309; also Chem. News *95*, 145.
Lincoln, A. T. Electrolytic Corrosion of Brasses, Trans. Am. Electrochem. Soc. *11*, 43.
Lincoln, A. T., Klein, D., and Howe, P. E. Electrolytic Corrosion of Brasses, J. Phys. Chem. *11*, 501.
Lincoln, A. T. and Klein, D. The Vapor Pressure of Aqueous Nitrate Solution, J. Phys. Chem. *11*, 318.
Lincoln, A. T. and Walton, J. H. Elementary Exercises in Quantitative Analysis Primarily for Students of Agriculture, The Macmillan Company, New York.
Parr, S. W. Available Hydrogen of Coal, J.A.C.S. *29*, 582
Parr, S. W. Coalite, Eng. and Min., J. *84*, 734.
Parr, S. W. Calorimeters, Power, June, 1907, 386.
Parr, S. W. Constants and Variables of the Parr Calorimeter, J.A.C.S. *29*, 1606.
Parr, S. W. Heat Production and Constituents of Coal, Eng. and Min. J. *83*, 1242.
Parr, S. W. Parr's Method for the Determination of the Heat of Combustion of Coal, Chem. Eng. *6*, 253.
Parr, S. W. and Francis, C. K. Artificial Modification of the Composition of Coal, Ill. State Geol. Survey, Bulletin *8*, 176.
Parr, S. W. and Hamilton, N. D. The Weathering of Coal, Univ. of Ill. Eng. Expt. Sta.; also Ill. State Geol. Survey, Bulletin *8*, 196.
Parr, S. W. and Wheeler, W. F. Alterations of the Composition of Coal During Ordinary Laboratory Storage, Ill. State Geol. Survey, Bulletin *8*, 167.

Bartow, E., Tonney, F. O., and Pearse, L. Report on the Sanitary Survey of Lake Michigan, Rept. Lake Mich. Water Comm. *2,* 37.
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Curtiss, R. S. and Kostalek, J. A. Pseudo Acid Esters in the Mesoxalic Ester Synthesis, J.A.C.S. *33,* 962.
Curtiss, R. S. and Spencer, F. G. C. Methyl Phenyliminomalonate and Its Reactions, J.A.C.S. *33,* 987.
Curtiss, R. S. and Strachan, E. K. Condensations in the Mesoxalic Ester Series, J.A.C.S. *33,* 396.
Derick, C. G. Applications of Polarity Measured in Terms of a Logarithmic Function of the Ionization Constant, J.A.C.S. *33,* 1152, 1162, 1167, 1181.
Hawk, P. B. Fasting Studies. II. On the Catalase Content of Tissues and Organs After Prolonged Fasting, J.A.C.S. *33,* 425.
Hawk, P. B. Fasting Studies. V. (Studies on Water Drinking. XI.) The Influence of an Excessive Water Ingestion Upon a Dog After a Prolonged Fast, J. Biol. Chem. *10,* 417.
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Hawk, P. B. Studies on Water Drinking. VI. The Influence of Moderate and Copious Water Drinking with Meals, Upon the Activity of the Pancreatic Function, Arch. Intern. Med. *8,* 382.
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Hawk, P. B. On the Differential Leucocyte Count During Prolonged Fasting, Proc. Am. Soc. Biol. Chem.; J. Biol. Chem. *9,* XXI.
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Hawk, P. B. and Mattill, H. A. Studies on Water Drinking. VIII, IX, X. Influence of Copious and Moderate Water Drinking with Meals, J.A.C.S. *33,* 1978, 1999, 2019.
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Hawk, P. B. and Wreath, S. R. Fasting Studies. IV. (Studies on Water Drinking. VII.) On the Allantoin and Purine Excretion of Fasting Dogs, J.A.C.S. *33,* 1601.
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Parr, S. W. A New Type of Gas Calorimeter, Progressive Age *39,* 1059.
Parr, S. W. Stoppage of Steam Pipes, Proc. Ill. Water Supply Assoc. *3,* 61.
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Parr, S. W. and Kressman, F. W. The Spontaneous Combustion of Coal, Univ. of Ill. Eng. Expt. Sta., Bulletin *46.*
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Smith, G. McP. Über das an Quecksilber reichste Lithiumamalgam, Z. anorg. Chem. *74,* 172.
Washburn, E. W. Caesiumnitrate und das Massenwirkungsgesetz, Z. Elektrochem. *17,* 13.
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## 1912

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Burgess, L. L. and Kamm, O. Cobaltinitrites and Their Application to Analytical Chemistry, J.A.C.S. *34,* 652.
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Hawk, P. B. A Note on a Glycogen-free Liver, J.A.C.S. *34,* 825.
Hawk, P. B., Howe, P. E., and Mattill, H. A. Fasting Studies. VI. Distribution of Nitrogen During a Fast of 117 Days, J. Biol. Chem. *11,* 103.
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